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THE
YOUNG GEOGRAPHER
AND
Aſtronomer's beſt Companion.

CONTAINING,

I. The Elements of Modern Geography, in which, beſides many other uſeful Articles, the Latitude and Longitude of a great Variety of Places are given from the lateſt Obſervations.

II. A comprehenſive Syſtem of Ancient Geography, both ſacred and profane, particularly adapted to the Illuſtration of the Claſſic Authors, and of the Hiſtorical Parts of the Bible.

III. The Deſcription and Uſe of the Celeſtial and Terreſtrial Globes, in which particular Attention has been given to the regular Diſpoſition, and moſt convenient Solution of a numerous Collection of Problems, which are ſucceeded by ſeveral ingenious and entertaining Paradoxes for the Exerciſe of the Learner.—Alſo the Principles of Dialling, as it is performed and illuſtrated by the Globes;—and the Conſtruction, and Uſe of the different Kinds of Maps.

IV. The Elements of Aſtronomy, in which, beſides a large Account of the Solar Syſtem, and of the various Motions, Revolutions, &c. of the Planets and Comets, are given the Theory of the Four Seaſons, the Harveſt-Moons, Eclipſes, Tides, and ſeveral other Phænomena too numerous to be here mentioned. To this Part is added a copious Appendix, containing the Elements of Chronology, a Science very intimately connected with that of Aſtronomy.

The Whole is illuſtrated with

THE NECESSARY ENGRAVINGS.

And, though principally intended for

THE USE OF SCHOOLS,

May ſerve as a convenient Memorandum-Book for thoſe Gentlemen and Ladies who have been already inſtructed in the Sciences above-mentioned.

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LONDON:
Printed for R. BALDWIN, No. 47, in *Paternoſter-Row*.
MDCCLXXIII.

BRITISH MUSEUM
31 AUG 48

TO

JOHN HAWKESWORTH, LL. D.

WHO IS EQUALLY DISTINGUISHED

AS AN EXAMPLE AND A PATRON

OF LITERARY MERIT,

THE FOLLOWING TREATISE,

COMPOSED FOR THE INSTRUCTION

OF THE BRITISH YOUTH,

IS, BY HIS PERMISSION,

HUMBLY INSCRIBED, BY

HIS MUCH OBLIGED,

AND MOST DEVOTED

HUMBLE SERVANT,

EVAN JONES.

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PREFACE.

THE following Treatiſe is deſigned to obviate an inconvenience which has long attended the education of Youth. Hitherto, when any young gentleman was to be inſtructed in Modern and Antient Geography, the uſe of the Globes, the uſe and conſtruction of Maps, and the principles of Aſtronomy and Chronology (all which branches of knowledge are intimately connected with each other in reality, and therefore *ought* to be ſo in the practice of teaching) the Maſter has generally been obliged either to put into the hands of his Pupil a ſeparate Treatiſe upon each of thoſe ſubjects, or to confine his curioſity to two or three of them at moſt. The latter method is attended with an evident imperfection; and the former occaſions much unneceſſary expence to the parent, and trouble to the teacher, who is thereby obliged to ſelect from a copious variety of materials the few inſtructions which are deſigned only to *prepare* the underſtanding of a young beginner for future improvements. The Author of the following pages has endeavoured to remove this inconvenience.

The *firſt* part of this performance contains the Elements of Modern Geography, or rather *Topography*; which is all that is generally taught, or expected to be taught in Schools. What appeared to be neceſſary upon this ſubject is delivered in a ſet of Geographical Tables, ſpecifying the latitude and longitude of every metropolis, many of which (though with ſome alterations and additions) were borrowed from the ingenious Mr. *Donne*. As to the religion, government, manners, commerce, &c. of particular nations, an account of theſe could not be attempted in a work of this ſize. Maps to illuſtrate the Tables are likewiſe omitted, excepting a general Map of the World, and a Map of the Holy Land: becauſe every maſter of an academy either is or *ought* to be provided with a much fuller and more accurate ſet than could be given in a volume of this ſize.

Part the *ſecond* contains what is not to be met with in any of the Treatiſes which have been publiſhed for the ordinary uſe of ſchools, —— a copious abſtract of Antient Geography, both ſacred and profane,—— which muſt certainly be a uſeful, and, indeed, a neceſſary aſſiſtant to thoſe who read the Claſſics or the Bible. What is offered upon this ſubject was chiefly extracted from the learned *Abbé de Freſnoy.* The Maps which are neceſſary to elucidate this part of the work have been omitted, for the ſame reaſon as the modern Maps.

In part the *third*, (beſides a particular deſcription of the Globes, proper directions how to chooſe them, and a collection of Problems more regularly diſpoſed than in moſt other School-books) will be found the Theory, Uſe, and *practical* Conſtruction of Maps, an article which has been unaccountably neglected by almoſt every writer of the kind: Though accuſtoming Pupils to the frequent drawing of Maps, ſuch as a general Map of the World, a Map of Europe, a Map of England, &c. is the moſt entertaining, the moſt effectual, and the ſpeedieſt method of teaching the Principles of Topography, or local Geography. Such as are deſirous to be acquainted with the *geometrical* Conſtruction of Maps (which is the moſt *accurate* and compleat method) may conſult the learned *Mead*, who has written profeſſedly and very largely on the ſubject.

Part the *fourth* and laſt contains the Elements of Aſtronomy; in which the Reader will be agreeably ſurprized with a much fuller and extenſive ſyſtem of that noble and delightful ſcience than could be expected in a work ſo conciſe and cheap. What is here delivered upon this ſubject was carefully ſelected from the moſt approved and *plaineſt* writers, and particularly the induſtrious Mr. *Ferguſon*, who has contributed very liberally and ſucceſsfully

fully to enlarge and facilitate the path to philoſophical knowledge. There is likewiſe added, by way of Appendix, a comprehenſive Syſtem of Chronology (a ſcience too much neglected in Schools) in which particular attention is paid to the inſtruction and entertainment of claſſical readers.

Throughout the whole performance the cuſtomary method of proceeding by Queſtion and Anſwer has been abandoned, as being both tedious and impertinent where neither humour nor controverſy ſhould be introduced; though care has been taken to ſay *as much* upon every part of the ſubject as is neceſſary to be taught in Schools.

As to the merit of this laborious compilation, which has been executed upon a newer and more extenſive plan than any hitherto publiſhed, it is ſubmitted to the judgment of able and experienced Teachers. If they think it ſufficiently adapted to anſwer the purpoſes for which the Author compoſed it, he flatters himſelf they will honour it with their encouragement.

It is only neceſſary further to add, that the little Treatiſe here offered to the Public, though chiefly deſigned for the uſe of Schools, may likewiſe ſerve as a convenient memorandum-book to thoſe who have already been inſtructed in the ſciences of which it delivers the firſt elements.

ERRATA.

Page 4, line 10, for *diviſion* read *diviſions*. P. 28, l. 27, for *Teſlis* read *Teflis*. P. 37, l. 19, 20, 21. *N. B.* That part of *Louiſiana* of which *New Orleans* is the capital has been exchanged with the Spaniards for the iſland of *St. Domingo*. P. 106, l. 14, for *were* read *was*. P. 112, l. *ult.* for *larger* read *largeſt*. P. 117, l. 22, for *philoſopher's* read *philoſophical*. P. 122, l. 7, for *the bear*, read *a bear*. P. 129, l. 2, for *tropic* read *tropics*. P. 153, l. 20, omit *globe* at the beginning of the line. P. 192, l. 14, for *lanet* read *planet*.

PART THE FIRST:

CONTAINING THE

ELEMENTS

OF

Modern Geography.

CHAP. I.

Geographical Diviſions of the Earth.

GEOGRAPHY is a ſcience, which deſcribes the figure, magnitude, and poſition, of the ſeveral parts of the ſurface of the earth.

The geographical diviſions of the earth are either *natural*, or *political*. The former reſpect the ſurface of the earth, without conſidering it as inhabited; but we view it, in the latter, as it is divided into different countries, by the ſeveral ſtates, or political communities, which inhabit it.

The earth is a ſpherical, or round body; and the ſurface of it is *naturally* divided into *land*, and *water*: but the ſurface of the water is about three times that of the land, which has been hitherto diſcovered.

The *land* is divided into *continents*, *iſlands*, *peninſulas*, *iſthmuſes*, and *capes* and *promontories*.

A *continent* is a very large tract of land, containing many countries and kingdoms, and, conſequently, not eaſily diſcernible to be ſurrounded by the ſea. The earth is uſually divided into two grand continents; viz. the *old* and *new*, or the *eaſtern* and *weſtern*; the former of which comprehends Europe, Aſia, and Africa; and the latter North and South America.

An *iſland* is a tract of land ſurrounded on every ſide by water; as Great Britain, and Ireland.

A *peninſula* is a tract of land ſurrounded by water, except on one part, where it is united to its reſpective continent by a narrow neck; as the Morea in Turkey.

An *iſthmus* is that neck of land which joins a peninſula to the continent; as the iſthmus of Corinth.

A *promontory* is a high tract of land, which projects into the ſea, and its extremity is called a *cape* or *headland*; as the Cape of Good Hope in Africa, and Cape Comorin in the Eaſt-Indies.

The water is divided into *oceans*, *ſeas*, *ſtraits*, *gulphs*, *bays*, *lakes*, and *rivers*.

An *ocean* is a large collection of ſalt water, which ſeparates one continent from another. The three grand oceans are, the *Atlantic*, which divides Africa and Europe from America; the *Pacific* ocean, or *South-Sea*, which divides America from Aſia; and the *Indian* ocean, which divides Africa, and the Eaſt-Indies, from New Holland.

A *ſea* is a ſmaller body of ſalt water, or a part of the ocean, which divides one country from another, or waſhes ſome particular ſhore, from whence it uſually borrows its name; as the Mediterranean, the Baltic, &c.

A *gulph* is a ſmall ſea, which is ſurrounded with land, except on one part, where it communicates with the main, by ſome particular paſſage or inlet; as the gulphs of Mexico and Finland.

A *ſtraight*, *ſtreight*, or *ſtrait*, is an inlet, or paſſage, out of one ſea, or part of the ocean, into another; as the ſtraights of Gibraltar and Magellan. A ſtraight is ſometimes called a *Sound*; and that which leads into the Baltic, is called *the Sound*, by way of eminence.

A *bay* is a ſmall gulph, or arm of the ſea, running up into the land, and terminating in a nook. It is commonly wider in the middle than at the entrance, which is called the *mouth of the bay*. When a bay is very ſmall, it is called a *creek*.

A *lake* is a collection of ſtanding water, in ſome inland place. There are four kinds of lakes: 1. ſuch as neither emit nor receive rivers, and which are formed by inundations, heavy rains, or perennial ſprings at the bottom. 2. Such as emit rivers without receiving any. Theſe owe their origin to ſprings. 3. Such as receive rivers without emitting any, loſing as much water by exhalation, or ſubterraneous drains, as they receive. 4. Such as both receive and emit rivers. If the quantity of water they emit is *greater* than what they receive, they muſt have a ſpring at the bottom; if *leſs*, their water muſt decreaſe, in porportion, by the ſame means as that of the third ſort; if *equal*, they have neither hidden ſprings nor drains.

A *river* is a flux of water, continued through a long narrow channel, proceeding partly from ſprings, and partly from lakes, or the concurrence of brooks and rivulets; and, if large, always emptying itſelf into the ſea, or a lake; as the Wolga, the Danube, and the Thames.

From the above definitions of the ſeveral parts of the land and water, it is eaſy to perceive that they correſpond to each other very nearly; an ocean anſwering to a continent, a ſea to a country or kingdom, a gulph to a peninſula, a ſtraight to an iſthmus, a bay to a promontory, and a lake to an iſland.

We ſhall now proceed to the *political* diviſion of the earth, into ſtates and kingdoms. But, here, it will be needleſs to ſpecify the boundaries and ſituation of each different country; for, as thoſe countries may always be readily found, by referring to the latitude and longitude of the metropolis, as will be hereafter directed, ſo their ſituation will be more effectually underſtood and remembered, by frequently conſulting the maps, than by any written detail. It will be equally unneceſſary to ſpecify the extent of particular countries, as determined by their greateſt latitude and longitude; for it cannot be ſuppoſed that theſe circumſtances will be accurately committed to memory, and they may, at any time, be eaſily found by thoſe who are in the leaſt acquainted with the uſe of the globes or maps; and as to the religion, laws, language, &c. of particular countries, it would be abſurd to expect an account of theſe in the following work, which muſt neceſſarily be conſtructed upon as conciſe a plan as will be conſiſtent with the due improvement of the learner. I ſhall therefore content myſelf with inſerting a few memorial tables, which will be more or leſs enlarged, in proportion to the proximity and relative importance of the different countries they contain. In the general tables, the firſt column will contain the names of countries; the ſecond their ſeveral poſitions, from the middle of their reſpective quarter of the world; the third the chief city in each; and the fourth and fifth the latitude and longitude of each city. I ſhall likewiſe employ the following abbreviations; viz. E. for empire; K. kingdom; R. republic; D. dutchy; El. electorate; P. principality.

After learning theſe tables, it will be neceſſary to refer conſtantly to the maps, that the form, ſituation, and relative magnitude of each country, may be as ſtrongly impreſſed upon the mind as poſſible.

CHAP. II.

Of the grand Diviſions and Subdiviſions of the Earth.

WE have already obſerved that the land is divided into two continents, viz. the Eaſtern and Weſtern, which are frequently called the old and new world. That on the right hand, in a general map of the earth, is called the *Eaſtern continent*, and comprehends Europe, Aſia, and Africa; and that on the left is called the *Weſtern*, and comprehends America, both North and South: ſo that the four grand quarters of the world are *Europe*, *Aſia*, *Africa*, and *America*. We ſhall deſcribe each in its proper order; but as the firſt of them, viz. Europe, is the quarter we inhabit, and which it more particularly concerns us to be acquainted with, we ſhall deſcribe it more largely than any of the remaining three.

EUROPE is ſituated between 36 and 72 degrees of N. latitude, and the longitudes of 10 degrees W. and 65 E. from the meridian of London. Its greateſt length, meaſuring from Cape St. Vincent in Portugal, to the mouth of the river Oby in Muſcovy (viz. from S. W. to N. E.) is about 3000 miles ; and its greateſt breadth, meaſuring from the North Cape of Norway to Cape Cagha or Matapan in the Morea, is about 2500 miles. It is bounded on the North by the Frozen ſea, on the South by the Mediterranean, on the Eaſt by Aſia, and on the Weſt by the Weſtern or Atlantic ocean. Its countries, and chief cities, are as follow.

Countries.	*Poſiti.*	*Chief Cities.*	*Latitude.*	*Longi.*
1 K. *Denmark*	NW.	Copenhagen	55 41N	12 50E
2 R. *Dutchland*	W.	Amſterdam	52 23N	5 04E
3 K. *England*	W.	London	51 32N	0 00
4 K. *France*	W.	Paris	48 50N	2 25E
5 E. *Germany*	Mid.	Vienna	48 13N	16 28E
6 K. *Hungary*	Mid.	Preſburg	48 20N	17 30E
7 K. *Ireland*	W.	Dublin	53 12N	6 55W
8 K. *Italy*	S.	Rome	41 54N	12 45E
9 E. *Ruſſia* or *Muſcovy*	NE.	Peterſburg	60 00N	30 25E
10 R *Netherlands*	W.	Bruſſels	51 00N	4 06E
11 K. *Norway*	NNE.	Bergen	60 00N	6 00E
12 K. *Poland*	Mid.	Warſaw	52 14N	21 10E
13 K. *Portugal*	SW.	Liſbon	38 42N	8 52W
14 K. *Scotland*	W.	Edinburgh	55 58N	3 00W
15 K. *Sweden*	N.	Stockholm	59 20N	19 30E

Countries.	Poſiti.	Chief Cities.	Lati.	Longi.
16R. *Switzerland*	Mid.	Bern	47 00N	7 20E
17K. *Spain*	SW.	Madrid	40 25N	3 39W
18E. *Turkey*	SE.	Conſtantinople	41 00N	28 58E

There are four kingdoms in Europe, beſides thoſe abovementioned, which are included in one or other of the countries in the above table: viz.

The kingdom of Bohemia in Germany, whoſe metropolis is Prague.

The kingdom of Pruſſia, whoſe monarch reſides at Berlin.

Sardinia, an iſland belonging to Italy, lat. 40 N. and long. 9 E. the king reſides at Turin. And,

The kingdom of the Two Sicilies, whoſe king reſides at Naples.

As the knowledge of ſome parts of Europe, and particularly of our own country, is of greater conſequence to us than that of others, it will not be improper to ſubjoin the following tables.

I. PRINCIPAL STATES in GERMANY. *

States.	Chief Cities.	Lati.	Longi.
D. *Auſtria*	Vienna	48 13N	16 28E
El. *Bavaria*	Munich	48 05N	11 32E
K. *Bohemia*	Prague	50 00N	14 20E
El. *Brandenburg*	Berlin	52 39N	13 32E
El. *Cologne*	Cologne	50 50N	6 40E
El. *Hanover*	Hanover	52 32N	9 35E
P. *Heſſe Caſſel*	Caſſel	51 20N	9 20E
El. *Mentz*	Mentz	50 00N	8 00E

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* Germany is likewiſe divided into the 9 following circles, viz. Weſtphalia, Lower Saxony, Higher Saxony, Lower Rhine, Higher Rhine, Franconia, Suabia, Bavaria, and Auſtria.

States.	Chief Cities.	Lati.	Longi.
El. *Palatine*	Manheim	49 30N	7 20E
El. *Saxony*	Dreſden	51 00N	13 36E
El. *Triers*	Triers	49 55N	6 10E
D. *Wurtenburg*	Stutgard	48 40N	9 00E

II. PRINCIPAL STATES in ITALY.

R. *Genoa*	Genoa	44 25N	8 41E
R. *Lucca*	Lucca	43 45N	11 20E
D. *Mantua*	Mantua	45 20N	11 15E
D. *Milaneſe*	Milan	45 45N	9 30E
D. *Modena*	Modena	44 45N	10 20E
K. *Naples*	Naples	40 51N	14 45E
D. *Parmeſan*	Parma	44 45N	11 00E
Patriarchate	Rome	41 54N	12 45E
P. *Piedmont*	Turin	44 50N	7 16E
D. *Savoy*	Chamberry	45 40N	5 45E
D. *Tuſcany*	Florence	43 30N	12 15E
R. *Venice*	Venice	45 25N	12 10E

III. PROVINCES in SPAIN.

	Provinces.			
North. Diviſi.	*Gallicia*	Compoſtella	43 00N	9 15W
	Aſturia	Oviedo	43 30N	6 40W
	Biſcay	Bilboa	43 30N	3 00W
Eaſt. Diviſi.	*Navarre*	Pampeluna	43 50N	1 30W
	Arragon	Saragoſſa	41 32N	1 15W
	Catalonia	Barcelona	41 26N	2 18E
Southern Diviſion.	*Valentia*	Valentia	39 30N	00 40W
	Murcia	Murcia	38 06N	1 12W
	Granada	Granada	37 15N	3 40W
	Andaluſia	Seville	37 15N	6 00W
Middle Diviſion.	*Old Caſtile*	Burgos	42 30N	4 05W
	New Caſtile	Madrid	40 25N	3 39W
	Leon	Leon	43 00N	6 05W
	Eſtremadura	Merida	38 55N	6 32W

IV. Pro-

IV. PROVINCES in PORTUGAL.

Provinces.	*Chief Cities.*	*Lat.*	*Long.*
Entre Minho-Douro	Braga	41 20N	8 40W
Tralos Montes	Miranda	41 30N	6 45W
Beira	Coimbra	40 20N	9 00W
Eſtremadura	Liſbon	38 42N	8 52W
Alen Tajo	Evora	38 32N	8 20W
Algarva	Tavira	37 00N	8 32W

V. CANTONS of SWITZERLAND.

Cantons.			
Bern, Proteſtant	Bern	47 00N	7 20E
Fribourg, Popiſh	Fribourg	46 50N	6 55E
Baſil, Pr.	Baſil	47 40N	7 40E
Lucern, Po.	Lucern	47 00N	8 12E
Soloturn, Po.	Soloturn, *or* Soleure	47 18N	7 15E
Schaffhauſen, Pr.	Schaffhauſen	47 42N	8 40E
Zurich, Pr.	Zurich	47 52N	8 30E
Appenzel Pr.	Appenzel	47 30N	9 00E
Zug, Po.	Zug	46 55N	8 35E
Swiſs, Po.	Swiſſe	47 00N	8 30E
Glaris, Pr.	Glaris	47 00N	9 00E
Uri, Po.	Altorf	46 50N	1 30E
Underwald, Po.	Stantz	46 55N	8 20E

VI. PROVINCES in the NETHERLANDS.

	Provinces.			
1	*Dutch Brabant*	Boiſledue	51 45N	5 20E
		Bergen-op-zoom	51 30N	4 05E
		Maeſtricht	50 55N	5 40E
	Auſtrian Brabant	Bruſſels	50 50N	4 06E
		Louvain	51 00N	4 35E
2	*Antwerp*	Antwerp	51 13N	4 29E

	Provinces.	Chief Cities.	Lat.	Lon.
3	*Malines*	Mecklin	51 10N	4 22E
4	*Limburg*	Limburg	50 37N	6 05E
5	*Luxemburg*	Luxemburg	49 45N	6 08E
6	*Namur*	Namur	50 30N	4 50E
7	*Hainault Auſtrian*	Mons	50 34N	3 33E
	Hainault French	Valenciennes	50 24N	3 23E
8	*Cambreſis*	Cambray	50 15N	3 15E
9	*Artois*	Arras	50 20N	2 50E
10	*Flanders Dutch*	Sluys	51 18N	3 15E
	Flanders Auſtrian	Ghent	51 00N	3 36E
		Bruges	51 16N	3 05E
		Oſtend	51 14N	3 00E
		Oudenard	51 15N	2 50E
		Tournay	50 37N	3 30E
	Flanders French	Liſle	50 42N	3 00E
		Dunkirk	51 02N	2 27E
		Doway	50 25N	3 00E

VII. PROVINCES in DUTCHLAND, or the SEVEN UNITED NETHERLANDS.

1	*Holland*	Amſterdam	52 23N	5 04E
		Rotterdam	52 00N	4 55E
		Delft	52 06N	4 05E
		The Hague	52 10N	4 00E
		Haerlem	52 20N	4 10E
		Leyden	52 12N	4 00E
		Dort	51 47N	4 40E
2	*Zeland*	Middleburg	51 33N	3 30E
3	*Frieſland*	Lewarden	53 20N	5 35E
4	*Groningen*	Groningen	53 20N	6 40E
5	*Overyſſel*	Deventer	52 20N	6 00E

6 *Gel-*

	Provinces.	*Chief Cities.*	*Lat.*	*Long.*
6	*Gelderland* &	Nimeguen	51 55N	5 50E
	Zutphen	Arnheim	52 00N	5 50E
7	*Utrecht*	Utrecht	52 07N	5 00E

VIII. PROVINCES in FRANCE.

Northern Diviſion.	*Picardy*	Amiens	49 50N	2 30E
	Iſle of France	Paris	48 50N	2 25E
	Champaigne	Troyes	48 05N	4 45E
	Normandy	Rouen	49 30N	1 06E
	Bretany	Rennes	48 05N	1 45W
Mid. Di.	*Orleanoiſe*	Orleans	47 55N	2 00E
	Lionois	Lions	45 50N	4 55E
Southern Diviſion.	*Provence*	Aix	43 30N	5 25E
	Languedoc	Thoulouſe	43 40N	1 05E
	Guienne, and	Bourdeaux	44 50N	0 40W
	Gaſcony	Augh or Aux	43 40N	1 20E
Eaſtern Diviſion	*Dauphine*	Vieune	45 35N	4 44E
	Burgundy	Dijon	47 15N	5 04E
	Lorrain	Nancy	48 44N	6 00E
	Alſace.	Straſburg	48 38N	7 35E

IX. The iſland of Great-Britain is divided into South and North Britain, or into the kingdoms of England and Scotland. The name of Britain is derived from the word *Brit*, which, among the ancient inhabitants, ſignified *painted* or *ſtained*; becauſe the natives uſed to paint their bodies, that they might appear more formidable to their enemies.

ENGLAND, which lies between 2 deg. E. and 6 deg. 20 min. W. long. and between 50 and 56 degrees N. latitude, being 360 miles in length and 300 miles broad, in the South, and 100 in the North, is of a triangular form. It is bounded by Scotland on the North; by the German Sea on the Eaſt; by the Engliſh Channel on the South; and by St. George's, or the Iriſh Channel, on the Weſt. Its name (in Latin *Anglia*) is derived from the Angles, or Anglo-Saxons, who invaded and ſubdued great part of it in the fifth century, and erected ſeven kingdoms, which were called the Saxon Heptarchy. It is now divided into ſix circuits, and forty counties; all which, with their chief towns, are ſpecified in the following table, which ought to be perfectly committed to memory, and the ſituation, or relative poſition of each county, particularly attended to, as exhibited in a map of the kingdom.

	Counties.	*Chief Towns.*	*Diſtance and Poſition from London.*	
Home Circuit.	*Eſſex*	Chelmsford	29 miles	NE.
	Hertford	Hertford	21	N.
	Kent	Maidſtone	36	SE.
	Surry	Kingſton	12	W.
	Suſſex	Chicheſter	66	SW.
Norfolk Circuit.	*Buckinghamſhire*	Aleſbury	41	NW.
	Bedford	Bedford	48	NW.
	Huntingdon	Huntingdon	57	N.
	Cambridge	Cambridge	51	NE.
	Suffolk	Bury St. Edmonds	75	NE.
	Norfolk	Norwich	109	NE.
Oxford Circuit.	*Oxon*	Oxford	55	W.
	Berks	Reading	40	W.
	Glouceſter	Glouceſter	104	NW.
	Worceſter	Worceſter	119	NW.
	Monmouth	Monmouth	129	W.
	Hereford	Hereford	133	W.
	Salop	Shrewſbury	163	NW.
	Stafford	Stafford	174	NW.

Midland

	Counties.	Chief Cities.	Diſtance and Poſition from London.	
Midland Circuit.	*Warwick*	Warwick	105 miles	NW.
	Leiceſter	Leiceſter	99	NW.
	Derby	Derby	126	N.
	Nottingham	Nottingham	122	N.
	Lincoln	Lincoln	135	N.
	Rutland	Oakham	95	N.
	Northampton	Northampton	66	N.
Weſtern Circuit.	*Hants*	Wincheſter	66	SW.
	Wilts	Saliſbury	80	W.
	Dorſet	Dorcheſter	123	SW.
	Somerſet	Briſtol	117	W.
	Devon	Exeter	170	W.
	Cornwall	Launceſton	213	W.
Northern Circuit.	*York*	York	197	N.
	Durham	Durham	256	N.
	Northumberland	Newcaſtle	270	N.
		Lancaſter	233	NW.
	Lancaſter	Mancheſter	182	N.
	Weſtmoreland	Appleby	268	N.
	Cumberland	Carliſle	302	NW.

COUNTIES excluſive of the CIRCUITS.

Middleſex	*London*		
Cheſter or Cheſhire	*Cheſter*	182	NW.

Middleſex, as being the ſeat of the ſupreme courts of juſtice, and Cheſhire, as being a county Palatine, are not included in any of the circuits.

CITIES in ENGLAND.

				Lat.	*Lon.*
1	*London*	in	*Middleſex*	51 32N	00 00
2	*Weſtminſter*		*Ditto*	51 30N	00 00

Counties.		Chief Cities.	Latit.	Long.
3	*Ely* in	Cambridgeſhire	52 24N	00 15E
4	*Glouceſter*	Glouceſterſhire	51 50N	2 16W
5	*Worceſter*	Worceſterſhire	52 15N	2 15W
6	*Canterbury*	Kent	51 16N	1 15E
7	*Rocheſter*	Ditto	51 22N	0 34E
8	*Exeter*	Devonſhire	50 44N	3 40W
9	*Briſtol*	Part in Glouceſterſhire and part in Somerſetſhire	51 30N	2 40W
10	*Wincheſter*	Hampſhire	51 06N	1 24W
11	*Durham*	Durham	54 50N	1 12W
12	*Bath* and	Somerſetſhire	51 30N	2 30W
13	*Wells*	Ditto	51 20N	2 35W
14	*Cambridge*	Cambridgeſhire	52 15N	0 05E
15	*Oxford*	Oxfordſhire	51 45N	1 15W
16	*Lincoln*	Lincolnſhire	53 10N	0 27W
17	*Cheſter*	Cheſhire	53 15N	3 00W
18	*Chicheſter*	Suſſex	50 50N	0 50W
19	*York*	Yorkſhire	54 00N	0 50W
20	*Saliſbury*	Wiltſhire	51 00N	1 55W
21	*Carliſle*	Cumberland	54 47N	2 35W
22	*Coventry*	Warwickſhire	52 25N	1 26W
23	*Hereford*	Herefordſhire	52 06N	2 42W
24	*Norwich*	Norfolk	52 40N	1 26E
25	*Litchfield*	Staffordſhire	52 48N	1 59W
26	*Peterborough*	Northamptonſhire	52 33N	0 15W

The Cinque ports are Haſtings in Suſſex; Dover, Sandwich, Romney, and Hythe in Kent: and their three dependents, Rye, Winchelſea, and Seaford, in Suſſex.

CIRCUITS in WALES.

	Countries.	*Chief Towns.*	*Lat.*	*Long.*
N. E. Circuit.	*Flint*	St. Aſaph	53 18N	3 30 W
	Denbigh	Denbigh [*miles*	210NW.	fr. Lon.
	Montgomery	Montgomery	161NW.	fr. ditto
	Angleſea	Beaumaris	242NW.	fr. ditto
N. W. Cir.	*Carnarvon*	Bangor Lat.	53 20N	4 15W
	Merioneth	Delgelheu	52 09N	4 06W
S. E. Circ.	*Radnor*	Radnor [*miles*	25 NW.	of Heref.
	Brecon	Brecknock	163NW.	fr. Lon.
	Glamorgan	Llandaff Lat.	51 33N	3 20W
S. W. Circ.	*Pembroke*	Pembroke	51 43N	5 03W
	Cardigan	Cardigan [*miles*	230W.	from Lon.
	Caermarth.	Caermarthen	208W.	from ditto

The PRINCIPAL RIVERS in ENGLAND are,

1. The Thames, compoſed of the Tame and Iſis, which falls into the ſea below Sheerneſs in Kent.

2. The Medway, which falls into the mouth of the Thames.

3. The Severn, or Sabrina, eſteemed the ſecond river in England, which diſcharges itſelf into the Briſtol-Channel near King-road.

4. The Trent, which being joined by the Ouſe and ſeveral other rivers towards its mouth, is then called the Humber, and falls into the ſea below Hull in Yorkſhire.

5. The Ouſe, which falls into the Humber.

6. Another Ouſe, which falls into the ſea near Lynn in Norfolk.

7. The river Cam, which falls into the laſt mentioned Ouſe at the iſle of Ely.

8. The Tyne, which falls into the ſea at Tinmouth below Newcaſtle.

9. The Tees, which falls into the ſea below Stockton in Durham.

10. The Eden, which falls into Solway Frith beyond Carliſle.

11. The Lower Avon, which falls into the mouth of the Severn below Briſtol.

12. The Derwent, which falls into the Iriſh Channel, a little below Cockermouth in Cumberland.

13. The Ribble, which falls into the Iriſh ſea below Preſton in Lancaſhire.

14. The Merſey, which falls into the Iriſh ſea, a little below Liverpool in Lancaſhire.

15. The Dee, which falls into the Iriſh Channel, below Cheſter in Cheſhire.

16. The Tweed, which, running along the Borders of Scotland, falls into the German ſea at Berwick in Northumberland.

As to Mountains, there are very few conſiderable ones in South Britain: the higheſt hills are in Wales, and in the Weſt and North of England.

The Engliſh Lakes are alſo very few. The largeſt are; the Meres of Soham, Wittleſea, and Ramſey in Cambridgeſhire; and Wynander Mere in Weſtmoreland. There are likewiſe a few ſmall lakes in Lancaſhire, which go by the name of the Derwent Waters.

The chief Promontories or Headlands in England, are Flamborough-head, and Spurn-head in Yorkſhire; Wintertonneſs and Eaſtoneſs, in Norfolk; Orfordneſs in Suffolk; Waltonnaze in Eſſex; the North and South Forelands, and Dungenneſs, in Kent; Beachy-head in Suſſex; Dunnoſe, and the Needles, in the iſle of Wight;

Peverel-point, and the Race of Portland, in Dorſetſhire; Berry-point, Star-point, Bolt-head, Hartland-point, Bag-point, and Ormſhead in Devonſhire; Lizard-point, Land's-end, and Trevoza-point, in Cornwall; Naſh-point, and Worm's-head, in Glamorganſhire; St. Goven's-point, and the Biſhop and his Clerks, in Pembrokeſhire; Cardigan-point in Cardiganſhire; Sarnabuck-point in Merionethſhire; Brayekilput-point in Caernarvonſhire; Holy-head, and Hilary-point in Angleſey; and St. Bee's-Head in Cumberland.

The principal Foreſts in England are Windſor Foreſt in Berks, Epping Foreſt in Herts, New Foreſt in Hants, the Foreſt of Dean in Glouceſterſhire, and Sherwood Foreſt in Nottinghamſhire.

The principal Hot-Baths are thoſe of Bath and Briſtol in Somerſetſhire, and Buxton-wells in Derbyſhire.

The beſt Mineral Waters for drinking, are thoſe of Scarborough and Harrowgate in Yorkſhire; Tunbridge in Kent; Epſom, Cobham, and Dulwich in Surry; Northall and Barnet in Herts; Hampſtead, Iſlington, and Acton in Middleſex.

It will not be improper to add, that in the kingdom of England are two Univerſities, viz. Oxford, and Cambridge. There are likewiſe two Archbiſhoprics, and twenty four Biſhoprics; viz. the Archbiſhopric of Canterbury, preſiding over the Biſhoprics of London, Wincheſter, Ely, Lincoln, Rocheſter, Litchfield and Coventry, Hereford, Worceſter, Bath and Wells, Saliſbury, Exeter, Chicheſter, Norwich, Glouceſter, Oxford, Peterborough, Briſtol; and in

Wales St. David's, Landaff, St. Aſaph, and Bangor: and the Archbiſhopric of York, preſiding over the Biſhoprics of Durham, Carliſle, and Cheſter; to which might be added the Biſhopric of Sodor and Man, but this Biſhop has no ſeat in the Houſe of Peers.

There are likewiſe in England, beſides 29 cities (including the four Biſhoprics of Wales) upwards of 800 towns, and near 10,000 pariſhes, which are ſuppoſed to contain about 7,000,000 inhabitants.

The	40	counties in England ſend up to parliament	80 Knights
	25	cities (Ely none, London four) ſend	50 Citizens
	167	Boroughs, two each, ſend	334 Burgeſſes
	5	Boroughs (Abingdon, Banbury, Bewdley, Higham Ferrars, and Monmouth) one each	5 Burgeſſes
	5	Cinque ports, and three dependencies, two each	16 Barons
	2	Univerſities -	4 Repreſent.
	12	Counties in Wales, one each - - -	12 Knights
	12	Boroughs ditto (Pembroke 2, Merioneth none) one each -	12 Burgeſſes
		Total	513 Members

X. The KINGDOM of SCOTLAND.

King James VI. of Scotland ſucceeding to the crown of England, upon the death of Queen

Elizabeth, Anno 1603, this kingdom was then united to that of England.

Scotland lies between 55 and 59 degrees N. latitude, and 1 and 6 degrees Weſt longitude, and is about 300 miles in length, and 150 miles broad, though in ſome parts it is much narrower.

It is bounded on the North by the Caledonian ocean, or North-ſea; on the Eaſt by the German ſea; on the South by the River Tweed, the Tiviot hills, and the river Eſk, which divide it from England; and on the Weſt by the Iriſh ſea, and Atlantic ocean.

Shires.	*Chief Towns.*	*Lati.*	*Long.*
1 *Edinburgh*	Edinburgh	56 00N	3 00W
2 *Haddington*	Dunbar	56 00N	2 12W
3 *Berwick*	Berwick	56 05N	2 27W
4 *Roxborough*	Jedburgh	55 25N	2 15W
5 *Selkirk*	Selkirk	55 26N	2 45W
6 *Peebles*	Peebles	55 35N	3 00W
7 *Lanerk*	Glaſgow	55 50N	4 08W
8 *Dumfries*	Dumfries	54 45N	3 20W
9 *Wigtown*	Wigtown	55 00N	4 40W
10 *Air*	Air	55 30N	4 40W
11 *Dumbarton*	Dumbarton	56 00N	4 32W
12 *Bute*	Rothſay	55 50N	5 00W
13 *Caithneſs*	Brodwick	58 48N	2 50W
14 *Renfrew*	Renfrew	55 50N	4 20W
15 *Stirling*	Stirling	56 12N	3 50W
16 *Linlithgow*	Linlithgow	55 50N	3 20W
17 *Perth*	Perth	56 25N	3 10W
18 *Kincardin*	Bervey	56 40N	2 5W
19 *Aberdeen*	Aberdeen	57 12N	1 45W
20 *Inverneſs*	Inverneſs	57 36N	4 00W
21 *Nairne*	Nairne	57 40N	3 30W
22 *Cromartie*	Cromartie	57 40N	3 40W
23 *Argyle*	Inverary	56 28N	5 00W
24 *Fife*	St. Andrews	56 20N	2 25W

	Shires.	*Chief Towns.*	*Lati.*	*Long.*
25	*Forfar*	Montroſe	56 34N	2 10W
26	*Bamff*	Bamff	57 40N	2 05W
27	*Kirkcudbright*	Kirkcudbright	54 38N	4 05W
28	*Sutherland*	Dornock	58 15N	3 20W
29	*Clackmannan*	Clackmannan	56 15N	3 40W
30	*Kinroſs*	Culroſs	56 08N	3 34W
31	*Roſs*	Dingwall	57 45N	4 15W
32	*Elgin*	Elgin	57 40N	2 45W
33	*Orkney*	Kirkwall	59 45N	0 25W

Theſe 33 ſhires ſend 30 repreſentatives to the parliament of Great-Britain; Nairne and Cromartie chooſing alternately, as alſo Bute and Caithneſs, and Clackmannan and Kinroſs. Beſides theſe, 15 Burgeſſes are ſent from Scotland, which, added to the former, make up the famous patriotic number 45, and complete the Britiſh ſenate to 558 members. The northern counties are called the Highlands, and the ſouthern the Lowlands.

The Iſlands of Scotland are;

1. The Hebrides, or Weſtern iſlands; the largeſt of which are the iſlands of Skye, Mull, Lewis, Iſla, Bute, Arran, Northviſt, Southviſt, and St. Kilda. They lie between 55 and 59 degrees of N. latitude.

2. The Orcades, or Orkney iſlands, between 59 and 60 degrees of N. Latitude. It is ſuppoſed by ſome that they were the Thule of the ancients; the largeſt of them is called Pomona. They are divided from the continent, or main land, by Portland-Frith, which is remarkable for its ſwift and contrary tides, and violent whirlpools, which make it a dangerous paſſage to ſtrangers, eſpecially in a calm.

3. The Shetland Iſles, being 46 in number, between 60 and 62 degrees of N. latitude. The Dutch employ a great number of veſſels here (in

ſome ſeaſons 1000 or 1500) in the herring-fiſhery, which commences about Midſummer. The largeſt of theſe iſlands are Mainland, Yell, and Vuiſt.

The chief rivers in Scotland are, the Forth, Tay, and Clyde. The Forth diſcharges itſelf into the Frith of Forth; the Tay falls into the ſea at Dundee; and the Clyde runs by Hamilton, and Glaſgow, into the Iriſh ſea.

The principal Lakes are Loch-tay, Loch-neſs, Loch-leven, and Loch-jern. The lochs Tay, Neſs, and Jern never freeze; but there is a lake in Shaglaſh, which is covered with ice the whole ſummer.

The univerſities in Scotland are thoſe of St. Andrew, Aberdeen, Edinburgh, and Glaſgow.

The Archbiſhoprics are thoſe of St. Andrews and Glaſgow; and the Biſhoprics thoſe of Edinburgh, Dunkeld, Aberdeen, Murray, Brechin, Dumblain, Roſs, Caithneſs, Orkney, Galloway, Argyle, and the Iſles; but the eſtabliſhed religion is preſbyterianiſm. They have a general ſynod, or aſſembly, every year, 13 provincial ſynods, 68 preſbyteries, and 938 pariſhes. The general ſynod determine all appeals from the inferior eccleſiaſtical judicatories; and, though the crown uſually appoints a lord high commiſſioner to ſit amongſt them, he has no vote in their aſſembly.

XI. The Island and Kingdom of Ireland.

This kingdom was finally, and completely reduced under the crown of England, by the glorious King William the third. It lies between 51 and 56 degrees N. latitude and 5 and 10 degrees W. longitude, being 300 miles long, and 150 in breadth. Its area is reckoned to be in proportion to that of England and Wales, as 18 to 30. It is bounded on the North by the Deucaledonian ſea; on the Weſt by the Atlantic ocean; on the South by the Virginian ſea; and on the Eaſt by the Iriſh ſea, or St. George's Channel. It is almoſt 30 miles diſtant from Scotland, and about 60 from Wales, where the paſſage is ſhorteſt.

The four PROVINCES of IRELAND are,

Provinces.		*Chief Cities.*	*Lat.*	*Long.*
Leinſter	E.	Dublin	53 16N	6 25W
Ulſter	N.	Londonderry	54 52N	7 40W
Munſter	S.	Cork	51 40N	8 25W
Connaught	W.	Galway	53 12N	9 12W

The 12 COUNTIES in LEINSTER Province are,

	Counties.	*Chief Towns.*	*Lat.*	*Long.*
1	*Louth*	Drogheda	53 45N	6 30W
2	*Meath-Eaſt*	Trim	53 35N	7 00W
3	*Meath-Weſt*	Mullingar	53 30N	7 25W
4	*Longford*	Longford	53 40N	7 48W
5	*Dublin*	Dublin	53 16N	6 25W
6	*Kildare*	Kildare	53 10N	7 00W
7	*King's County*	Philipſtown	53 15N	7 20W
8	*Queen's County*	Mary-burrough	52 55N	7 25W
9	*Wicklow*	Wicklow	52 53N	6 10W
10	*Carlow*	Carlow	52 45N	7 05W
11	*Wexford*	Wexford	52 15N	6 25W
12	*Kilkenny*	Kilkenny	52 30N	7 15W

The nine COUNTIES in ULSTER Province are,

1	*Donnegal* or *Tyrconnel*	Donnegal	54 38N	8 15W
2	*Londonderry*	Londonderry	54 52N	7 40W
3	*Antrim*	Carrickfergus	54 45N	6 15W
4	*Tyrone*	Dungannon	54 28N	7 00W

Counties.	Chief Towns.	Lon.	Lat.
5 *Fermanagh*	Inniſkilling	54 20N	7 50W
6 *Armagh*	Armagh	54 30N	6 45W
7 *Down*	Down Patrick	54 23N	5 50W
8 *Monaghan*	Monaghan	54 14N	7 08W
9 *Cavan*	Cavan	54 00N	7 35W

The ſix COUNTIES in MUNSTER Province are,

1 *Cork*	Cork	51 40N	8 25W
2 *Waterford*	Waterford	52 12N	7 00W
3 *Tipperary*	Clonmell	52 15N	7 38W
4 *Limerick*	Limerick	52 35N	8 30W
5 *Kerry*	Tralee	52 10N	9 55W
6 *Clare*	Ennis	52 44N	9 16W

4. The five COUNTIES in CONNAUGHT Province are,

1 *Galway*	Galway	53 12N	9 12W
2 *Roſcommon*	Roſcommon	53 35N	8 20W
3 *Mayo*	Caſtlebar	53 49N	9 30W
4 *Sligoe*	Sligoe	54 10N	8 42W
5 *Leitrim*	Leitrim	53 57N	8 15W

The kingdom of Ireland is remarkable for its exemption from ſerpents, and other venomous creatures; a circumſtance which is particularly noticed by Solinus, who lived ſeveral centuries before St. Patrick, the pretended miraculous author of it.

The only Univerſity in Ireland is that of Dublin, which conſiſts of one college, called the college of *The holy undivided Trinity*, founded by Queen Elizabeth.

The eſtabliſhed religion is the ſame as in England, though many other ſects are tolerated, of which the Romiſh is by far the moſt numerous.

The government of the church is veſted in four archbiſhops, under whoſe viſitation are 19 biſhops; viz.

1. The archbiſhop of Armagh, preſiding over the biſhops of Meath, Clogher, Down, Kilmore, Dromore, Raphoe, and Derry.

2. The archbiſhop of Dublin, preſiding over the biſhops of Kildare, Oſſory, Ferns, and Leighlin.

3. The archbiſhop of Caſhell, preſiding over the biſhops of Limerick, Waterford, Cork, Cloyne, and Killaloe.

4. The archbiſhop of Tuam, preſiding over the biſhops of Elphin, Clonfert, and Killala.

Ireland is governed by a lord-lieutenant, or vice-roy, and his parliament; the houſe of commons conſiſting of 300 members. It contains 118 cities and corporate towns.

To theſe general tables, it will not be amiſs to ſubjoin the following proportions between the ſeveral parts of Europe, making Great-Britain the ſtandard; viz.

Great-Britain	1,00	*Germany*	3,53	*Sweden*	3,66
France	1,70	*Holland*	0,11	*Poland*	3,39
Spain	1,81	*Flanders*	0,18	*Turkey*	3,18
Portugal	0,36	*Switzerl.*	0,17	*Muſcovy*	10,13
Italy	1,19	*Denmark*	1,49		

I. The principal SEAS, GULPHS, and BAYS in EUROPE are,

The Adriatic Sea, between Italy and Turkey.

The Baltic ſea, between Denmark, Poland, and Sweden.

The Bay of Biſcay, between France, and Spain.

The Engliſh Channel, between England and France.

The Euxine or Black Sea, between Europe and Aſia.

The German Ocean, between Germany and Britain.

The Gulph of Bothnia, N. E. of Sweden.

The Gulph of Finland, between Sweden and Ruſſia.

The Gulph of Venice, at the N. W. end of the Adriatic.

The Mediterranean Sea, between Europe and Africa. And,

The White ſea, in the N. N. W. parts of Muſcovy.

II. The principal ISLANDS in EUROPE, beſides the BRITISH ones, which have been already noticed, are;

The *Azores*, or weſtern Iſlands, belonging to Portugal in lat. 38 N. and long. 29 W.

The *Daniſh* Iſles: viz. eaſt and weſt Greenland, near the N. pole, though it is not yet determined whether they are iſlands or not; and
Ferro iſles, lat. 62 N. long. 5 W.
Iceland, lat. 65 N. long. 19 W.
Zeland in the Baltic, lat. 56 N. long. 12 E.
The *Italian* iſles in the Mediterranean, which are
Corſica, lat. 42 N. long. 9 E.
Lipara iſles, lat. 39 N. long. 15 E.
Sardinia, lat. 40 N. long. 10 E.
Sicily lat. 37 N. long. 14 E.
Spaniſh iſles in the Mediterranean, which are
Ivica, lat. 39 N. long. 1 E.
Majorca, lat. 40 N. long. 3 E.

Minorca, lat. 40 N. long. 4 E. now belonging to England.

The *Swediſh* iſles in the Baltic, which are,
Aland, lat. 60 N. long. 20 E.
Gothland, lat. 57 N. long. 17. E.
Oeland lat. 57. N. long. 16 E.
Rugen lat. 55 N. long. 14 E.

The *Turkiſh* iſles in the Mediterranean, which are,
The Archipelago iſles, lat. 38 N. long. 24 E.
Candia, lat. 35 N. long. 25 E.

III. The principal RIVERS in EUROPE are,

The Thames and Severn, in England.
The Shannon in Ireland.
The Tagus, in Portugal.
The Po and Tiber, in Italy.
The Weiſel in Poland.
The Elbe, the Oder, the Rhine, and the Danube, in Germany.
The Seine and the Rhone, in France. And,
The Don and Wolga, in Ruſſia.

IV. The principal MOUNTAINS in EUROPE are,

The Alps, between France and Italy.
The Apennine hills, in Italy.
The Pyrenean Hills, between France and Spain.
The Carpathian mountains, in the South of Poland.
The Peak of Derbyſhire, in England.
The Plinlimmon, in Wales.

Beſides theſe, there are ſeveral Volcanos, or burning mountains in Europe; as mount Veſunius and Stromboli in Naples; mount Ætna, vow called Mon-Gibel, in Sicily; and mount

Hecla, in Iceland, which cannot be approached without danger.

It is now time to proceed to the remaining quarters of the world; but, as the knowledge of theſe is not ſo intereſting to the learner as that of Europe, and as our plan requires that we ſhould be as conciſe as we conveniently can, we ſhall confine ourſelves to the geographical tables of the ingenious Mr. Donne, with a few alterations and additions.

CHAP. III.

OF ASIA.

ASIA is ſituated between 72 degrees N. and 10 degres S. latitude, and 25 and 148 degrees of eaſt longitude, being about 4800 miles long, and 4300 broad. It is bounded on the north by the Frozen ocean; on the eaſt, by the Pacific ocean; on the ſouth by the Indian ocean; and on the weſt by the Red-ſea, Levant, Archipelago, Helleſpont, Propontis, Boſphorus, Black-ſea, Palus Mæotis, river Don, and a line drawn from that river to the rivers Tobol and Oby, the latter of which diſcharges itſelf into the Frozen ocean.

It contains the following COUNTRIES.

Countries.	*Poſi.*	*Chief Cities.*	*Lat.*	*Long.*
Arabia	SW.	Mecca	21 40N	41 00E
Buckharia, or Uſbecs	Mid.	Samarkand	40 00N	66 00E
Chineſe Tartary	E	Chynian	42 00N	118 00E

Countries.	*Posi.*	*Chief Cities.*	*Lat.*	*Lat.*
E. *China*	SE	Peking	39 54N	116 41E
		Nanking	32 07N	118 35E
		Canton	23 08N	113 08E
India Eaſt of the river Ganges	S.	Ava	20 00N	95 00E
		Pegu	17 00N	96 58E
		Siam	14 18N	100 55E
		Cambodia	10 35N	104 45E
India Weſt of the Ganges	S.	Agra	26 43N	76 49E
		Delli	28 00N	79 00E
Karazm	Mid.	Urjenz	41 00N	96 00E
K. *Korea*	E.	Kinkitau	38 00N	123 00E
E. *Perſia*	S.	Iſpahan	32 30N	52 55E
E. *Siberia*	N.	Tobolſki	57 30N	63 00E
		Aſtracan	47 00N	49 00E
K. *Syria*	W.	Aleppo	36 30N	36 00E
K. *Thibet*	Mid.	Eſkerdu	35 00N	75 00E
E. *Turky*	W.	Smyrna	37 30N	27 00E

Some of theſe countries include ſeveral others.

ASIATIC TURKEY contains,

Curdiſtan or Aſſyria	E.	Betlis	37 30N	45 00E
Deſart of Arabia	S.			
Diarbec	E.	Mouſol	36 00N	43 00E
Eyraca	SE.	Bagdat	33 00N	44 00E
Georgia	N.	Teſlis	43 00N	47 20E
Natolia	W.	Smyrna	37 30N	27 00E
Syria	W.	Aleppo	36 30N	36 00E
Turcomania or Armenia	E.	Erzerum	40 00N	41 00E
The Holy Land	W.	Jeruſalem	32 00N	34 00E

As the Eaſt-India trade forms a conſiderable branch of our commerce, it will not be amiſs to ſubjoin the following tables.

Coro-

	Countries.	Chief Cities.	Lat.	Lon.
Coromandel Coaſt.	*Biſnager, or Carnate,* E. *Side*	Madraſs	13 00N	80 00E
	K. *Golconda*	Golconda	16 00N	77 00E
	K. *Orixa*	Orixa	20 00N	80 00E
Malabar C.	*Decan*	Goa	15 20N	73 20E
	Biſnager W. *or Carnate*	Calcut	12 00N	70 00E
		Cochin	10 00N	75 00E
Northern Parts.	*Bengal*	Patna	25 00N	84 00E
	Cambaya or Guzaret	Surat	21 00N	71 00E
	Indoſtan	Delli	29 06N	76 00E

II. INDIA EAST of the GANGES.

K. *Ava*	Ava	20 00N	96 00E
K. *Cambodia*	Cambodia	13 00N	105 00E
K. *Cochin China*	Thoanoa	16 00N	108 00E
K. *Laos*	Lanchan	18 00N	101 00E
K. *Malacca*	Malacca	3 00N	101 00E
K. *Pegu*	Pegu	17 00N	94 00E
K. *Siam*	Siam	15 00N	100 00E
K. *Tonquin*	Keccio	18 00N	103 00E

The EUROPEAN Settlements in ASIA are,

ENGLISH. Bombay, on the coaſt of Malabar; fort St. David's and Madras, on the coaſt of Coromandel; Maſulipatan, Calcutta, Chandernagor, &c. in the kingdom of Bengal.

DUTCH. Cranganor, Cochin, Coulan or Quilon, Manar on the coaſt of Malabar, Colombo in the iſle of Ceylon, Batavia in the iſle of Java, the Spice iſlands, &c.

SPANISH. Lucon, Porto Mandalo, Caceres, Mindora, Mindanao, &c. in the Philippines.

PORTUGUEZE. Diu, God, Baticala, Manguelor, &c. on the coaſt of India; Macao in China.

FRENCH. Pondicherry, Sandraſpatan, Vizagapatan, &c. on the coaſt of Coromandel.

DANES. Tranquebar, on the coaſt of Coromandel.

I. The principal SEAS, GULPHS, and BAYS, in Aſia, are,

The Bay of Bengal, between India E. and India W. of the Ganges.

The Bay of Siam, between Siam and Malacca.

The Caſpian ſea, which lies between Siberia on the N. Korazm on the E. Perſia on the S. and Georgia on the W.

The gulph of Perſia, between Perſia on the N. E. and Arabia on the S. W.

The Korean ſea, between Korea and the iſlands of Japan.

The Yellow ſea, between China and the Japan iſles.

II. The principal ASIATIC ISLANDS are,

	Iſlands.	*Chief Cities.*	*Lati.*	*Longi.*
Chineſe I.	*Hainan or Aynan*	Tan	20 00N	109 00E
	Formoſa	Taywanſa	24 00N	121 00E
	Macao	Makau	22 00N	113 00E
Japan Iſles.	*Bongo*	Bongo	32 00N	132 00E
	Japan	Jeddo	36 00N	141 00E
	Tonſa	Tonſa	33 00N	141 00E
Moluccas.	*Celebes*	Macaſſer	05 00S	118 00E
	Ceram	Ambay	03 00S	129 00E
	Gilolo	Gilolo	00 40N	125 00E
Philippines.	*Luconia*	Manila	16 00N	121 00E
	Mindanao	Mindanao	07 00N	126 00E
	Samar			
Sunda Iſlands.	*Borneo*	Borneo	04 30N	111 00E
	Java	Batavia	06 00S	106 00E
	Sumatra	Achin or Achen	05 30N	93 30E

Adaman

Iſlands.	*Chief Cities.*	*Latit.*	*Long.*
Adaman Iſles		13 00N	92 00E
Ceylon	Candy	08 00N	79 00E
Ladrones		13 00N	142 00E
Maldivia Iſles		5 00N	75 00E
Necobar I.		7 00N	94 00E

III. The moſt remarkable RIVERS in ASIA are,

The Tigris, in Turkey, which diſcharges itſelf into the Euphrates in Eyraca Arabic.

The Euphrates, in Turkey, which falls into the Gulph of Perſia, 50 miles below Baſſora.

The Ganges, in the hither India, which running from the N. W. to the S. E. near 1500 miles, diſcharges itſelf by ſeveral channels into the Bay of Bengal.

IV. The moſt remarkable MOUNTAINS in ASIA are,

The Caucaſus, which is a chain of mountains running from the leſſer Aſia, through the N. of Perſia to Eaſt-India, and obtaining different names in the different countries through which it paſſes.

CAAP. IV.

OF AFRICA.

AFRICA is a very large peninſula which is joined to Aſia by the iſthmus of Suez. It lies between 18 degrees weſt and 50 eaſt longitude, and between 37 N. and 35 S. latitude; being about 4300 miles long, and 4200 broad where its breadth is moſt conſiderable. It is bounded on the N. by the Mediterranean; on the E. by the iſthmus of Suez, the Red ſea, and the Indian ocean; on the S. by the Southern ocean; and on the weſt by the Atlantic ocean.

The principal COUNTRIES in AFRICA are,

Countries.	*Poſi.*	*Chief City.*	*Lati.*	*Long.*
F. *Abyſſinia or Ethiopia*	E.	Ambamarjan or Ambara	13 00N	35 .00E
K. *Annian*	E.	Adel	08 00N	44 00E
K. *Algiers*	N.	Algiers	36 40N	02 20E
K. *Angola*	SW.	Loando	07 00S	14 00E
K. *Barca*	N.	Docra	32 00N	27 00E
K. *Benguela*	SSW	Benguela	12 00S	11 00E
K. *Benin*	SW.	Benin	07 30N	05 00E
Bidſara	SW.	Bidſara	06 00N	18 00E
Biledulgerid	Mid.	Dara	29 00N	12 00E
K. *Congo*	SW.	St. Salvador	13 00N	18 00E
K. *Egypt*	NE.	Cairo	30 00N	31 00E
Guinea	SW.	Cape Coaſt-caſtle	05 00N	00 00E
K. *Loanga*	SW.	Loango	03 00S	11 00E
Mandinga	W.	Konjur	14 00N	07 00W
E. *Morocco*	NW	Fez	33 30N	06 00W
Negroland	Mid.	Tombute	14 00N	01 00W

Nubia

Countries.	*Poſi.*	*Chief City.*	*Lati.*	*Long.*
Nubia	Mid.	Nubia	19 00N	33 00E
Sofalo	SE.	Sofala	20 00S	33 00E
K. *Tripoli*	N.	Tripoli	32 00N	12 00E
K. *Tunis*	N.	Tunis	36 20N	10 00E
Zanguebar	E.	Melinda	03 00S	40 00E

All the Northern coaſt of Africa, from Morocco to Egypt, is called Barbary.

The coaſt of Guinea is divided into the Gold coaſt, Grain coaſt, Ivory coaſt, Sierra Leone, and the Slave coaſt.

The interior or inland parts of Africa are little known.

I. The EUROPEAN Settlements in AFRICA are,

ENGLISH. Senegal. I. Goree, river Gambia, Cabo Corſo, Iſle of St. Helena, and ſeveral forts on the Gold coaſt.

FRENCH. Iſles of France and Bourbon, Baſtion de France, on the coaſt of Barbary.

DUTCH. St. George de la Mina, and ſeveral other forts on the Gold coaſt, ſome ſettlements in the kingdom of Benin, and the Cape of Good Hope.

SPANISH. Oran, Mellila, Penon de Velez, upon the coaſt of Barbary, Ceuta, and the Canary iſlands.

PORTUGUESE. Mazagan on the coaſt of Barbary; ſeveral forts and ſettlements in the kingdoms of Congo, Loango, Melinda, and Mombaza; the Azores, Cape de Verde iſlands, Maderas, St. Thomas, Prince's iſland, &c.

DANISH. Fort Chriſtianburg on the Gold coaſt.

II. The principal Seas, Gulphs and Bays in Africa are,

The Bight of Benin, on the coaſt of Guinea.
The Red ſea, between Africa and Aſia.
The Moſambic ſea, between Africa and the iſland of Madagaſcar.
Saldana Bay, near the Cape of Good Hope.
Gulph of Guinea, on the coaſt of Guinea.

III. The iſlands of Africa are divided into thoſe which lie in the Atlantic, and thoſe which lie in the Eaſtern ocean.

	Iſlands.	*Chief Places.*	*Lat.*	*Long.*
In the Atlantic.	*The Azores*	Angra	39 00N	27 00W
	The Madera Iſles	Funchali	32 33N	16 00W
	The Canaries	Palma	28 00N	18 00W
	The Cape de Verdes	St. Jago	15 00N	13 00W
	Iſles of the gulph of Guinea			
	St. Helena	St. Helena	16 00S	06 30W
In the Eaſtern Ocean.	*Madagaſcar*		20 00S	47 00E
	Iſle of Bourbon	Bourbon	21 00S	54 00E
	Iſle of France		30 00S	55 00E
	Socotra	Calanſia	12 00N	53 00E

Madagaſcar is one of the largeſt iſlands in the world, being near 1000 miles long, and 300 broad. It lies between 22 and 26 degrees S. latitude, and 43 and 51 degrees E. longitude.

IV. The

IV. The chief RIVERS in AFRICA are,

The Nile in Egypt, which falls into the Levant by ſeveral channels, the chief of which are thoſe of Roſetta and Damietta. It iſſues from a lake in Abyſſinia, and begins to riſe when the ſun is vertical there, and the annual rains commence, viz. at the latter end of May; and continues riſing till September or October, when it overflows the country, and makes it exceedingly fruitful. It uſually riſes 24 feet, and then continues to decreaſe till the latter end of May the year following.

The Niger in Negroland, which is ſaid to diſcharge itſelf into the Atlantic ocean by three channels, the moſt ſoutherly called Rio Grande, that in the middle the Gambia, and that on the north the river Senegal. The low country is overflowed by it at the latter end of ſummer, as Egypt is by the Nile; which is owing in both caſes to the periodical rains that fall within the tropics.

V. The moſt remarkable MOUNTAINS in AFRICA are,

1. The Atlas, which is a range of mountains running through the north of Africa, to the ocean which divides Africa from America. Upon this account that ocean has obtained the name of the Atlantic.

2. The Pico of Tenerif one of the largeſt of the Canaries. The white top of it may be ſeen at ſea upwards of 100 miles. This mountain, which is a vulcano, is reckoned to be one of the higheſt in the world. It is in the ſhape of a lofty cone, or ſugar-loaf.

3. The Lunar mountains in Monoemugi.

CHAP. V.

AMERICA.

AMERICA, or the weſtern continent, (which is frequently called the New World, on account of its late diſcovery) lies between 35 and 150 degrees W. longitude, and between 80 degrees N. and 58 degrees S. latitude: Its greateſt length from N. to S. is between eight and nine thouſand miles, and its breadth from E. to W. about 3000 miles. It is bounded on the N. by the unknown parts about the Arctic pole; on the eaſt by the Atlantic ocean; on the S. by the Southern ocean, and on the W. by the Pacific ocean.

This large continent was firſt diſcovered by Chriſtopher Columbus a Genoeſe, in the year 1492: but it received its name from Americus Veſputius a Florentine, who ſoon after diſcovered thoſe parts of it which lie near the Equinoctial.

It is uſually divided into north and ſouth America, which are joined together by the iſthmus of Darien.

NORTH AMERICA.

North America, ſo far as it hath been diſcovered, lies between the latitudes of 10 and 80 degrees N. and the longitudes of 50 and 150 degrees W.

The principal COUNTRIES it contains.

Countries.	*Poſi.*	*Chief Towns.*	*Lati.*	*Longitude.*
California	W.		34 00N	118 00W
Canada	Mid.	Quebec	47 35N	74 00W
S. Carolina	SE.	Charles Tow	32 30N	79 00W
Florida	S.	St. Auguſtin	30 00N	82 00W
Georgia	SSE.	Savannah	32 00N	82 00W
Jerſeys	E.	New York	41 00N	74 30W
Louiſiana	S.	Fort Lewis	18 00N	90 00W
Maryland	E.	Annapolis	39 25N	78 00W
New Britain	NNE	Fort Rupert	51 00N	80 00W
New England	E.	Boſton	42 24N	71 00W
New Mexico	S.	Santa Fé	36 00N	109 00W
New Wales	N.	Port Nelſon	57 00N	91 00W
Nova Scotia	NE.	Hallifax	45 00N	63 00W
Old Mexico	SW.	Mexico	20 00N	103 00W
Penſilvania	E.	Philadelphia	40 50N	74 00W
Virginia	E.	James Town	37 30N	76 30W

California, and Old and New Mexico belong to Spain: Louiſiana on the W. of the Miſſiſſippi to France, and the other provinces to England.

SOUTH AMERICA.

South America lies between the latitudes of 10 degrees N. and 58 W. and between the longitudes of 35 and 83 degrees W.

The principal COUNTRIES it contains are,

Amazonia	Mid.	River Amazon	00 00S	49 00W
Braſil	E.	St. Salvador	12 00S	38 00W
Chili	SW.	St. Jago	34 00S	72 00W
Guiana	NE.	Surinam	06 30N	57 00W
La Plata	SE.	Buenos Ayres	35 00S	57 00W
Paraguay	Mid.	Aſſumption	25 00S	58 00W

Patagonia

Countries.	*Poſi.*	*Chief Towns.*	*Lat.*	*Longi.*
Patagonia	S.	Cape Virg. Mary	52 00S	64 00W
Peru	W.	Lima	12 00S	78 00W
Terra Firma	NW.	Panama	09 00N	82 00W

Chili, La Plata, Paraguay, Peru, and Terra Firma, belong to Spain: Braſil to Portugal: and Amazonia, Guiana, and Patagonia to the native Indians. But ſome parts of the coaſt of Guiana are poſſeſſed by the Dutch and French; Surinam, the capital of the province, belongs to the Dutch.

I. The principal SEAS, GULPHS, and BAYS in AMERICA are,

The bay of California on the eaſt of California.

The bay of Fundy in Nova Scotia.

The Caribbean ſea, which lies between Terra Firma on the S. and the Antilles, and Caribbean iſlands on the N.

The bay of Honduras, which is the part of the Caribbean ſea next to Mexico or New Spain.

The gulph of St. Lawrence, between Newfoundland, and Nova Scotia.

The gulph of Mexico, between Old Mexico, Louiſiana, and Florida.

The bay of Campeachy, part of the gulph of Mexico.

Hudſon's bay on the N. W. of Nova Scotia.

II. The principal ISLANDS in NORTH AMERICA are,

Newfoundland and Cape Breton, lying off Nova Scotia.

The Bermudas, or Summer's iſlands off Carolina.

The Lucayos or Bahama iſlands off the Cape of Florida.

The iſles Cuba, Hiſpaniola and Jamaica at the mouth of the gulph of Mexico.

The Antilles or Caribbees (among which is Barbadoes) on the eaſt of Hiſpaniola.

The principal ISLANDS in SOUTH AMERICA are,

The Leeward iſlands N. E. of Terra Firma: of which the chief is Trinidada.

Falkland iſland off the coaſt of Patagonia.

Tierra del Fuego, which is parted from the mainland on the ſouth by the ſtraights of Magellan, and whoſe ſouthermoſt point is called Cape Horn.

Gallipago iſles, N. W. off Peru.

Solomon iſlands, S. lat. 10. W. long. 160. They are 18 in number, of which Iſabella (the largeſt) is about 400 miles long and 70 broad.

IV. The principal RIVERS in AMERICA are,

1. The river St. Lawrence, which opens into the ſea on the N. of Nova Scotia, and is ſeveral miles broad. Quebec is ſituated on the N. W. ſide of it.

2. The Miſſiſſippi, which opens into the gulph of Mexico.

3. The Oronooko which runs into the Atlantic ocean a little below the iſland of Trinidad.

4. The river Amazon which riſes in Peru, and running eaſtward above 3000 miles, falls into the Atlantic by ſeveral channels under the equator. It overflows annually, like other tro-

pical rivers, and is then 150 miles broad at the mouth.

5. The river Rio-de-la-Plata, which diſcharges itſelf into the Atlantic below the city of Buenos Ayres in the country of La-Plata, from whence it takes its name.

V. The principal Mountains in America are,

The Apalachian hills in North America running along the back of our colonies from the country of the Six Nations almoſt to the gulph of Mexico.

Mount Potoſi in Peru, which affords the richeſt ſilver-mine in the world.

The Andes or Cordeleras, a chain of mountains which run almoſt the whole length of South America through Peru and Chili, and almoſt parallel to the Pacific ocean. They are eſteemed the higheſt land in the world, being continually covered with ſnow in the warmeſt climates.

To this ſhort, but comprehenſive account we have given of the four quarters of the world, it will not be amiſs to add that the ſeas and unknown parts of the earth (by a meaſurement of the beſt maps) contain 160,522,026 ſquare miles, and the inhabited parts, 38,990,569 ſquare miles,

amounting in all to 199,512,595, which is the number of ſquare miles on the whole ſurface of our globe.

Europe alone contains	4,456,065	ſquare miles.
Aſia,	10,768,823	ditto.
Africa,	9,654,807	ditto.
America	14,110,874	ditto.
Total	38,990,569	

PART THE SECOND:

CONTAINING A

COPIOUS ABSTRACT

OF

Ancient Geography.

CHAP. I.

Of the Ancient Diviſion of the Earth.

THE ancients divided the world, as we do, into land and water.

The land was divided by ſome into *Aſia* and *Europa*, Europe including Africa; and by others into *Aſia*, *Enropa*, *Africa*, and *Ægyptus*, the latter being conſidered as one of the general parts, on account of its populouſneſs: by others into *Aſia*, *Africa*, *Europa*, and *Græcia*; but moſt commonly, into *Aſia*, *Europa*, and *Africa*.

Aſia was divided from Europe by the river Tanais, or Don; and by the Nile from Africa, which was divided on the north from the other two continents by the Mediterranean.

The water was divided into the *Mare Externum*, and the *Mare Internum*. The *Mare Externum*, comprehending all the ocean beyond Hercules's Pillars or without the Straits of Gibraltar, was divided into *Oceanus Septemtrionalis*, or the Northern Ocean, *Oceanus Eoüs*, or the Eaſtern Ocean, beyond China, *Oceanus Occiduus, ſive Heſperius*, the Weſtern or Atlantic Ocean, and *Oceanus Auſtralis*, comprehending the Indian and Ethiopic Oceans.

The *Mare Internum*, or Mediterranean, was much better known to the ancients than the former. The moſt noted parts of this ſea were,

1. *Mare Ionium*, the Ionian Sea, extending from Sicily to the iſle of Crete or Candia; and containing the *Sinus Ionicus vel Adriaticus*, the gulph of Venice, the *Mare Auſonium vel Siculum*, extending from Sicily to the Morea, and *Mare Ionium*, properly ſo called, running from the gulph of Venice to the Morea, along the coaſts of Greece.

2. *Mare Ægeum vel Argolicum*, or the Archipelago, lying between Crete, the Morea, Greece, the Dardanelles, Aſia Minor, and Rhodes.

3. *Mare Libycum*, the Libyan Sea, lying along the coaſts of Barca, Tripoli, and Biſerta.

4. *Pontus Euxinus*, the Black Sea.

5. *Palus Mæotis*, the ſea of Zabacche or Tana.

6. *Propontis*, the ſea of Marmora, beyond the Dardanelles.

The *Helleſpontus*, and the *Boſphorus*, are now called the Straits of Gallipoli, and the Straits of Conſtantinople.

CHAP.

CHAP. II.

OF EUROPE.

EUROPE (ſometimes called by the ancients *Tyria*, *Galatia*, and *Celtica)* was always more eſteemed than the other continents, both for the temperature of it's climate, and the learning and courage of its inhabitants.

Europe was anciently divided into nine parts, viz. I. *Inſulæ Britannicæ*, the Britiſh Iſles. II. *Hiſpania*, Spain. III. *Gallia*, France. IV. *Germania*, Germany. V. *Sarmatia*, containing Poland and part of Muſcovy. VI. *Dacia*, part of Hungary, and Tranſylvania. VII. *Illyricum*, part of Auſtria and Hungary, Sclavonia, Boſnia, and Dalmatia. VIII. *Græcia*, Greece. IX. *Italia*, Italy.

I. INSULÆ BRITANNICÆ.

The Britiſh Iſles were anciently divided into three parts; viz. *Albion*, Great-Britain; *Hibernia*, Ireland; and *Inſulæ Minores*, the leſſer iſles, including Angleſea, the Iſle of Man, the Scilly-Iſlands, the Weſtern Iſlands, and the Orkneys.

Hibernia (which was alſo called *Parva Britannia*, *Juverna*, *Jerna*, *Jernis*, and *Iris*,) was inhabited by 18 different nations.

Albion, otherwiſe called *Britannia Major*, was divided into *Albion citerior* or South Britain, which was conquered by the Romans, and *Albion ulterior*, or North Britain, of which they ſubdued but a ſmall part.

Albion citerior, now called *England*, was divided into *Albion ſuperior*, and *Albion inferior*.

Albion ſuperior contained three provinces, viz.

1. *Britannia prima*, ſo called becauſe it was the firſt part which was conquered by the Romans. This province included ſix nations, viz. the *Cantii*, who inhabited the county of Kent; the *Regni*, inhabiting Surry, Suſſex, and the S. part of Hampſhire; the *Belgæ*, inhabiting Somerſetſhire, Wiltſhire, and the N. part of Hampſhire; the *Atrebates*, or *Atrebatii*, inhabiting Berks; the *Durotriges*, inhabiting Dorſetſhire; and the *Danmonii* or *Dumnonii* inhabiting Devonſhire and Cornwall.

2. *Flavia Cæſarienſis*, ſo called from Flavius, the ſon of the emperor Theodoſius. This province alſo contained ſix nations, viz. the *Trinobantes*, inhabiting Middleſex and Eſſex; the *Iceni*, Suffolk, Norfolk, Cambridgeſhire, and Huntingdonſhire; the *Cathieuchlani*, Buckinghamſhire, Herts, and Bedfordſhire; the *Dobuni*, Glouceſterſhire, and Oxfordſhire; the *Cornavii*, Warwickſhire, Worceſterſhire, Staffordſhire, Shropſhire, and Cheſhire; and the *Coritani*, Northamptonſhire, Leiceſterſhire, Rutlandſhire, Lincolnſhire, Nottinghamſhire, and Derbyſhire.

3. *Britannia ſecunda*, ſo called becauſe it was the ſecond province conquered by the Romans. It contained three nations, viz. the *Silures*, who inhabited Herefordſhire, Radnorſhire, Brecknockſhire, Monmouthſhire, and Glamorganſhire; the *Demetæ*, Caermarthenſhire, Pembrokeſhire, and Cardiganſhire; and the *Ordovices*, Flintſhire, Denbighſhire, Montgomeryſhire, Merionethſhire, Caernarvonſhire, and Angleſea.

Albion inferior contained the provinces of *Maxima Cæſarienſis* and *Valentia.* The former was ſubdivided into two nations, viz. the *Pariſi*, who inhabited the Eaſt Riding of Yorkſhire; and the *Brigantes*, who inhabited the Weſt and North Ridings of Yorkſhire, Biſhoprick of Durham, Lancaſhire, Weſtmoreland, and Cumberland. The province of *Valentia* contained but one nation, called the *Ottadini*, who inhabited Northumberland; and was bounded on the N. by the wall which was built by the Romans to ſtop the incurſions of the Picts. Beyond this lay *Albion ulterior*, or Scotland, which was alſo called *Albion Borealis* or *Barbara*, and divided into two nations called the *Vecturiones*, and *Dicaledones*.

The moſt remarkable river in *Albion citerior* was the *Tameſis* or Thames.

II. Hispania, *Spain.*

Spain was generally called *Hiſpania*, but often *Iberia*, *Celtiberia*, and *Heſperia ultima*; and contained the preſent kingdoms of Spain and Portugal. It was divided into *Hiſpania ulterior*, *exterior*, or *inferior*; and *Hiſpania citerior*, *interior*, *ſuperior*, or *Tarraconenſis*.

Hiſpania ulterior contained the provinces of *Bætica*, and *Luſitania*.

Bætica, ſo named from the river *Bætis*, or Guadalquivir, comprehended the provinces of Andaluſia and Granada, part of New Caſtile ſouth of the river Guadiana, and a ſmall part of Alentejo eaſt of the ſame river. It was inhabited by the *Baſtuli* or *Pæni*, the *Turduli*, and part of the *Celtici* and *Turdetani*.

Luſitania contained Portugal, and the weſt part of Leon and the two Caſtilles in Spain. It was anciently inhabited by the *Luſitani*, the *Vettones*, and part of the *Turdetani* and *Celtici*. The *Luſitani* poſſeſſed the country between the rivers Tajo and Douro.

Hiſpania citerior contained the remaining and largeſt part of Spain. Among the 28 nations who poſſeſſed it, thoſe moſt frequently mentioned by the claſſical writers were the *Aſtures*, who inhabited Aſturia de Oviedo, and part of Leon beyond the Douro; the *Vaccæi*, who inhabited part of Leon, Old Caſtille, and of the country beyond the Douro; the *Carpetani*, who inhabited part of Algarria and Mancha in new Caſtille; the *Oretani*, who inhabited part of la Mancha and Sierra in new Caſtille; the *Celtiberi*, who inhabited part of both Caſtilles, of the kingdom of Arragon, and Rioja; the *Vaſcones*, who inhabited the greateſt part of Navarre and Guipuſcoa, and a ſmall part of Saragoſſa; the *Ilergetes*, who inhabited part of the Dioceſes of Hueſca, Saragoſſa, and Balbaſtro; the *Cerretani* and *Caſtellani*, who dwelt in part of Catalonia at the bottom of the Pyrenees; and the *Indigetes*, who inhabited part of the county of Rouſillon.

The largeſt mountains in Spain were called the *Pyrenæi Montes*, now the Pyrenees. They divide Spain from France.

The moſt remarkable promontories were *Aphrodiſium*, or *Veneris promontorium*, now Cape de Creus; *Calpe promontorium*, Gibraltar; *Sacrum promontorium*, Cape St. Vincent; and *Lunæ promontorium*, the Cape of Mondego.

The moſt conſiderable rivers of Spain were called *Minius*, now the Minho; *Durius*, the Douro; *Tagus*, the Tajo; *Anas*, the Guadiana; *Bætis*, the Guadalquivir; *Terebus*, the Segura;

Sucro, the Xucar; *Turias*, the Guadalaviar; *Iberus*, the Ebro; *Sicoris*, the Siger; and *Sambroca*, the Ter.

The moſt remarkable iſlands were the *Baleares*, or *Balearides*, now Majorca and Minorca. They were remarkable for their expertneſs in ſlinging; and were therefore called *Baleares*, from the Greek word βαλλω, to throw.

III. OF GAUL.

Ancient *Gaul* was bounded by the Pyrenees, the Mediterranean, and the Var on the ſouth; by the Alps, and the Rhine on the eaſt; by the Rhine on the north; and by the ocean on the weſt. It has been variouſly divided at different times.

According to *Julius Cæſar*, who conquered the country, it was divided into three parts; viz. the *Belgæ*, the *Celtæ* or *Galli*, and the *Aquitani*. *Gallia Belgica* was bounded by the Seine, the Marne, the mountains of Vauge, the Rhine, and the ocean. *Gallia Celtica* was bounded by the ocean, the Seine, the Marne, the Saone, the Rhone, and the Garonne. *Gallia Aquitanica* was bounded by the ocean, the Garonne, and the Pyrenees. *Provincia*, now Provence, was that part of the country which was ſubdued by the Romans before the three above mentioned; and was bounded by the Garonne, the Sevennes, the lake of Geneva, the Alps, and the Mediterranean.

Gaul was afterwards divided by *Auguſtus* into four parts, viz. *Gallia Narbonenſis*, *Aquitania*, *Lugdunenſis*, and *Belgica*.

1. *Gallia Narbonenſis* comprehended Languedoc, the county of Foix, Gevaudan, Velay,

the Vivarois, Provence, Dauphine, and Savoy. Among the 17 people * which inhabited it were the *Volcæ Tectoſages*, comprehending the archbiſhopricks of Toulouſe and Narbonne, the Dioceſes of Bezieres, Carcaſſonne, St. Pons, Aleth, and part of Rouſillon; the *Volcæ Arecomici*, comprehending the Dioceſes of Niſmes, Uſez, Montpellier, Lodeve, and Agde; the *Helvii*, Vivarez; the *Allobroges*, the Viennois, Savoy, Greſivaudan, Genevois, Chablais, and Foſſigny; the *Centrones*, Tarantaiſe, and Val de Maurienne; the *Caturiges*, Gapencois; the *Seguſiani*, the Marquiſate of Suſe, and the Brianconnois; and the *Vocontii*, comprehending the Diois, Baronies, and Biſhoprick of Vaiſon.

The principal rivers in this diviſion were called the *Garumna*, now the Garonne; the *Rhodanus*, the Rhone, and *Varus*, the Var.

II. *Aquitania* was bounded by the Pyrenees, the ocean, and the river Loire. It contained 18 people, among which were the *Tarbelli*, the inhabitants of Bearn, and the Baſques; the *Auſcii*, the Dioceſes of Auſch, Lectoure, and Aire; the *Bituriges Vibiſci*, the Dioceſe of Bourdeaux; the *Nitiobriges*, the Agenois; the *Cadurci*, Quercy; the *Elutheri*, the Albigeois; the *Ruteni*, Rouergue; the *Gabali*, Gevaudan; the *Velauni*, Vellay; the *Arverni*, Auvergne, and Bourbonnois; the *Bituriges Cubi*, Berry; the *Lemovices*, the Limoſin; the *Petrocorii*, Perigord; the *Santones*, the Xaintonge; and the *Pictones*, Poitou.

III. *Gallia Lugdunenſis*, the largeſt diviſion of the four, was bounded by the ocean, the rivers *Ligeris*, Loire; *Sequana*, the Seine; *Matrona*, the Marne; and *Vogeſus Mons*, the mountains of Voſges. It contained 29 people, among whom were the *Seguſiani*, the Lyonnois, Beaujolois, Foret and la Breſſe; the *Helvetii*, the Swiſs; the *Bauraci*, the Biſhopric of Baſil; the *Sequani*, Franche-Comté; the *Lingones*, Dioceſe of Langres; *Ædui*, the Dutchy of Bourgogne; the *Senones*, the Dioceſes of Sens and Auxerre; *Pariſii*, the Dioceſe of Paris; the *Carnutes*, the Dioceſes of Chartres and Orleans; *Velocaſſes*, the Dioceſe of Rouen, excepting the county of Caux; the *Caletes*, the county of Caux; the *Lexobii*, the Dioceſe of Liſieux; the *Aulerci Eburovici*, the Dioceſe of Evreux; the *Aulerci Cenomani*, the Dioceſe of Mans; the *Aulerci Diablintes*, Perche; the *Unelli*, the Dioceſe of Coutance; the *Rhedones*, the Biſhoprics of Rennes, St. Malo, Dol, and St. Brieux; the *Oſiſmii*, the Biſhoprics of St. Paul de Leon, and of Treguier; the *Curioſolitæ*, the Biſhopric of Quimper and Cornouaille; the *Veneti*, the Dioceſe of Vannes; the *Nannetes*, the county of Nantois or Nantz; the *Andes*, Anjou; and the *Turones*, Touraine.

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* I have only noted thoſe people in each diviſion which are mentioned by Julius Cæſar.

To the rivers in this diviſion already mentioned, we may add the *Arar* or *Araris*, now the Saone.

IV. *Gallia Belgica* was bounded by the ocean, the county of Caux, the Seine, the Marn, the Mountains of Voſges, and the Rhine. It contained 21 people, among which were the *Bellovaci*, now the Beauvoiſis; the *Atrebates*, the Artois; the *Ambiani*, the Amiennois; the *Veromandui*, the Vermandois; the *Morini*, the Boulonois, le Païs reconquis, and Teutonic Flanders; the *Nervii*, Hainault, Cambreſis, and

French Flanders; the *Menapii*, part of Flanders, Brabant, Gueldres, Cleves, Juliers, and Cologne; the *Batavi*, part of Holland and Gueldres; the *Ubii*, Cologne, and part of Juliers; the *Atuatici*, the county of Namur, and part of Brabant; the *Treviri*, Treves or Triers, and part of Luxembourg; the *Vangiones*, part of the territory of Mentz, and of the Palatinate; the *Nemetes*, the Biſhopric of Spire; the *Tribocci*, the Biſhopric of Strazburg; the *Mediomatrici*, the inhabitants of the Pays Meſſin, and part of Lorrain and Luxemburg; the *Leuci*, the Biſhoprics of Toul and Verdun, and part of Lorraine; the *Rhemi*, the Dioceſes of Rheims, Châlons, and Laon; and the *Sueſſiones*, the Dioceſes of Soiſſons, and Noyon.

Gaul is divided by ſome authors into *Gallia Togata*, *Comata*, and *Braccata*, from the different dreſſes and habits of the ſeveral inhabitants. *Gallia Togata* was ſo called becauſe the inhabitants aſſumed the Roman Toga. This diviſion was the ſame as *Gallia Ciſalpina*. *Gallia Comata*, which was likewiſe called *Gallia Tranſalpina*, derived its name from *Coma*, a head of hair, becauſe the inhabitants wore their hair very long. *Gallia Braccata*, called afterwards *Narbonenſis*, derived its name from the *Braccæ*, or Breeches, which were worn by its inhabitants.

IV. OF GERMANY.

The ancient inhabitants of Germany called themſelves the *Theutiſci*; but by other nations they were named *Germani*, and *Celtæ*, and in the decline of the Roman Empire *Alemanni*. Ancient Germany, beſides the modern, comprehended as much of the United Provinces as lies north of the old Channel of the Rhine, as likewiſe Jutland in Denmark, part of Norway and Sweden, Poland Weſt of the Weiſſel, and Bohemia. It was divided with reſpect to its inhabitants into the *Iſtævones*, *Hermiones*, *Vindeli*, *Ingævones*, and *Peucini*. It was likewiſe divided into Germany between the Rhine and the Elbe (*inter Rhenum & Albim*,) Germany between the Elbe and the Weiſſel (*inter Albim & Viſtulam*,) Southern Germany, between the Rhine and the Danube (*Germania Auſtralis*) Germany beyond the Weiſſel, *Germania Tranſviſtulana*, and Germany beyond the ſea, with the adjacent iſlands, (*Germania Tranſmarina, & Inſulæ.*)

The *Iſtævones* were ſubdivided into 12 people, among which were the *Friſii**, who inhabited Friſeland, Groningen, part of Overiſſel, North Gelderland, and Utrecht, Weſt Friſeland, Gelderland and Holland, north of the Old Channel of the Rhine; the *Marſi*, part of Weſtphalia, and of the Biſhopric of Padderborn; the *Uſipii*, part of the counties of Reclinchuſen and Marck; the *Tencteri*, part of the Dutchies of Berg and Weſtphalia and of the county of Marck; and the *Mattiaci*, great part of Weteraw, Heſſe, Iſenberg, and Fulda.

The *Hermiones*, who occupied the middle parts of Germany, were likewiſe ſubdivided into twelve leſſer people, among which were the *Alemanni*, who inhabited Briſgaw, Baden, Wirtenberg, and part of the Vallies of Suabia; and the *Marcomanni*,

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* In the territories of this people were formerly lakes which had a communication with the ſea; but growing larger and uniting in proceſs of time, they now form a ſea called the Zuyderzea.

manni, who, having expelled the *Boii*, took poſſeſſion of their territories now called Bohemia.

The *Vindeli* were a powerful and extenſive nation, and were ſubdivided into 21 others, which were leſs conſiderable; among whom were the *Angli*, who inhabited part of Wagria, Stormar, and Mecklenburg, ſome of whom joining with the Saxons in their invaſion of Britain, gave the name of *Anglia*, or England, to the ſouthern part of the iſland; alſo the *Longobardi*, who inhabited part of the Old and New Marck of Brandenburg, from whence they paſſed into Italy, and ſettled in Lombardy; the *Gothi*, part of Royal Pruſſia in Poland; the *Burgundi*, part of great Poland, from whence they afterwards paſſed into Gaul; the *Saxones*, Holſatia, from whence they extended themſelves conſiderably towards the Rhine, and part of them with the aſſiſtance of the *Angles* conquered England; the *Cimbri*, Jutland; the *Teutones*, Zealand, and the Daniſh Iſlands in the Baltic; the *Suiones*, Sweden; and the *Sitones*, Norway.

The *Ingævones*, or northern provinces ſubject to Germany, were divided into three general parts, viz. *Scandia*, or Scandinavia, which comprehended Sweden and Norway, and was inhabited by the *Suiones* and *Sitones*; *Feningia*, Finland, &c. which contained the *Seyrri*, who inhabited Finland, the *Hyrri*, Nyland, and the *Carbones*, Carelia: and the *Inſulæ*, or Daniſh Iſlands, of which the principal was called *Codanonia*, now Zealand.

The *Southern Provinces* ſubject to, or depending upon Germany were, *Helvetia*, *Rhætia*, *Vindelicia*, and *Noricum*.

Helvetia, or Switzerland, inhabited by the *Helvetii*, was divided into nine parts, viz. *Tigurinus Pagus*, comprehending the Cantons of Zurich, Appenzeel, Schaff-houſe, and Rhinthal; *Tugenus Pagus*, the Cantons of Zug, Schwits, Glaris, Uri, and the county of Baden; *Ambronicus Pagus*, the Cantons of Bern, Underwarld, Lucerne, and Soleure, and part of that of Friburg; *Urbigenus* or *Verbigenus Pagus*, the principality of Neufchatel, greateſt part of the Canton of Friburg, and of the Pays Roman, or Vaud; the *Rauraci*, the Biſhopric and Canton of Baſil; the *Nantuates*, the lower part of the country of Vaux; the *Veragri*, the eaſtern part of the Lower Valais; the *Seduni*, the weſtern part of the Lower Valais; and the *Latobrigi*, the Upper Valais.

Rhætia was formerly a part of Italy, and comprehended the *Tulingi*, part of the modern Griſons, and the *Rhæti* who inhabited the Biſhoprics of Trent and Brixen, Tirol, the Veroneſe, and the Feltrin.

Vindelicia comprehended the *Brigantii*, who inhabited Bregentz, part of Conſtance and Walgow, and a ſmall part of Tirol; the *Eſtiones*, the weſtern part of Walgow; the *Licates*, part of Walgow, and the Dutchy of Newburg; the *Iſarci*, Upper Bavaria, and part of Paſſau; and the *Boii*, the greateſt part of Lower Bavaria.

Noricum, which, like the preceeding province, was frequently reckoned a part of *Illyricum*, was inhabited by the *Norici* or *Tauriſci*. It comprehended the *Norici*, particularly ſo called, who inhabited Upper Auſtria; the *Sevaces*, part of the Paſſau, and a ſmall part of the Upper Auſtria; the *Ambidrani*, eaſtern part of Stiria; the *Ambilici*, weſtern part of Stiria; the *Ambiſontii*, Carinthia; and the *Alauni*, part of Stiria, and of the Archbiſhopric of Saltzburg.

V. SARMATIA in EUROPE.

The northern inhabitants of Europe were in general called *Scythæ*, * and afterwards *Sarmatæ*, and *Germani*. They were divided into ſix nations, viz.

1. The *Æſtii*, or *Oſtiones*, comprehending the *Scirri*, who inhabited Pruſſia, and the *Hirri*, Livonia, and Samogitia.

2. The *Venedi*, who inhabited Lithuania, Polachia, D. of Smolenſko, and part of Maſſovia, and were ſubdivided into the *Troglodytæ*, the *Geloni*, and the *Neuri*.

3. The *Baſternæ*, comprehending the *Sidones* or inhabitants of the N. part of Black Ruſſia, and Little Poland near the Weiſſel; the *Atmones*, Upper Volhinia; the *Borani*, unknown; the *Peucini*, Podalia and Beſſarabia; the *Getarum Solitudo*, or territory of Oczakow S. of the Nieper, where the army of Darius Hyſtaſpes was deſtroyed; and the *Carpiani*, the S. part of little Poland and Black Ruſſia.

4 The *Tyragetæ*, or *Tyritæ*, who inhabited the Lower Volhinia, and included the *Axiacæ* who dwelt towards the mouth of the Nieper.

5. The *Roxolani*, who inhabited the ſouthern parts of Muſcovy, and part of Little Tartary, and were divided into the *Hamaxobii*, and *Georgi*, the latter of which inhabited Crim Tartary called anciently *Cherſoneſus Taurica*, becauſe one part of the *Georgi* were called *Tauri*.

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* Thoſe who lived near the Arctic Pole ſtill retained the name of *Scythæ*.

6. The *Riphaces* or *Riphæi*, who inhabited the northern parts of Muſcovy. Thoſe of them who lived neareſt to the Arctic Circle were called the *Hyperboræi*.

VI. ILLYRICUM.

Illyricum contained the modern Dalmatia, Servia, Boſnia, Croatia, Morlachia, Iſtria, Carniola, Carinthia, Stiria, Windiſmark, part of Auſtria, Sclavonia, and part of Hungary, and was divided into the three provinces of *Liburnia*, *Dalmatia*, and *Pannonia*.

Liburnia contained the *Japodes*, who inhabited Croatia, Windiſmark, and part of Iſtria; and the *Liburni*, who inhabited the weſtern part of modern Dalmatia.

Dalmatia contained the *Autariatæ*, or *Tariotæ*, who inhabited the middle part of the modern Dalmatia; the *Scordiſci*, who inhabited the eaſtern; and the *Vardæi*, who inhabited part of Dalmatia and Servia.

Pannonia was divided into *Pannonia ſuperior*, and *Pannonia inferior*: the former contained part of Auſtria, Stiria, Carniola, the county of Cilley, part of Windiſmark, and of Croatia, and Sclavonia; and the latter contained part of lower Hungary, of Sclavonia, Boſnia, and Servia.

VII. OF DACIA.

The province of *Dacia* was divided into three general parts, viz. *Dacia Vera*, the *Jazyges Metanaſtæ*, and *Mæſia* or *Myſia*.

Dacia Vera was divided into *Dacia Ripenſis*, containing part of Upper Hungary, and of Tranſylvania and Servia; *Dacia Mediterranea*, or *Ge-*

pidia Vera, containing part of Upper Hungary and Tranſylvania; and *Dacia Alpeſtris*, containing Walachia and Moldavia.

The *Jazyges Metanaſtæ* were divided into *Pars Borealis*, the northern part, and *Pars Auſtralis*, the ſouthern diviſion; both of which were a part of Upper Hungary.

Mæſia, or *Myſia*, was divided into *Mæſia ſuperior*, and *Mæſia inferior*. The former contained the *Dardani*, who inhabited the ſouthern part of Servia, and part of Bulgaria; the *Tricorneſii*, who inhabited the northern part of Servia; the *Timachi*, who inhabited part of Servia, and Bulgaria; and the *Myſi*, who inhabited part of Servia and Bulgaria, along the Danube. The latter, which was ſometimes called *Scythia Minor*, contained the *Scythæ*, who dwelt in Bulgaria, near the mouth of the Danube; the *Triballi*, who inhabited that part of Bulgaria which lies between the Danube and Romania; and the *Celegerri*, who dwelt in another part of Bulgaria, adjoining to Romania.

The *Danube*, a remarkably large river, which ran through Illyricum and Dacia, was called *Danubius* at its upper part, or ſource, and the *Iſter* towards its mouth.

VIII. OF GREECE.

Greece, which was one of the moſt renowned parts of Europe, may be divided into two general parts, viz. *Regnum Macedonicum*, the kingdom of Macedon, and *Græcia Vera*, Greece Proper.

1. The kingdom of *Macedon*, as enlarged by King Philip, the father of Alexander the Great,

was divided into *Macedonia*, *Theſſalia*, *Epirus*, and *Thracia*.

Macedonia, which was firſt called *Pæonia*, and afterwards *Æmonia*, retains its name to this day, and was divided into four parts. The firſt contained the province of *Edonis*, in which were the *Campi Philippici*, where Brutus and Caſſius were defeated; the province of *Odomantice*; the province of *Biſaltia*; and the province of *Sintica* or *Sintia*: this part was near the borders of Thrace. The ſecond part, the capital of which was *Theſſalonica*, now Salonichi, was ſubdivided into eight provinces, viz. *Mygdonia*, *Pelagonia*, *Pæonia*, *Orbelia*, *Almopia*, *Amphaxis*, *Paraxis*, and *Chalcidice*: in *Amphaxis* was the city of *Stagira*, now Libanova, famous for the birth of Ariſtotle; and in Chalcidice was the celebrated Mount *Athos*, now called Monte Santo. The third part, of which *Pella*, now Jeniſa, (the birthplace of Alexander the Great) was the capital, was divided into five provinces; viz. *Emathia*, or *Macedonia Propria*, *Bottiæa*, *Pieria* in which was the celebrated Mount *Olympus*, *Lynceſtis*, and *Pæoniæ Pars*. The fourth part, now called *Albania*, contained ten provinces; viz. the *Partheni*, *Albani*, *Taulantii*, *Eordeti*, *Daſſaretii*, *Deuriopes*, *Pelagonia Tripolitis*, *Stymphalia*, *Oreſtæ*, and *Elymiotæ*.

In *Macedonia* were likewiſe the *Sinus Strymonicus*, or gulph of Conteſſa, the *Sinus Singæus*, or gulph of Monte Santo, the *Sinus Toronaicus*, or gulph of Aiomana, and the *Sinus Thermaicus*, or gulph of Salonichi.

Theſſaly was divided into five provinces, viz. *Eſtiæotis*, *Theſſaliotis*, *Phthiotis*, (in which ſtood *Pharſalia*, now Farſa, where Julius Cæſar defeated Pompey the great) *Magneſia* or *Æmonii*, (in which was the famous *Tempe*, a very luxuriant ſpot of ground) and *Pelaſgiotis*.

Epirus, which retains its ancient name to this day, was divided into nine provinces; viz. *Chaonia* (now Canina,) *Theſprotia*, *Caſſiopæa*, *Almene*, *Acarnania*, (in which *Actium*, now Figalo, on the gulph de Larta, where Mark Anthony was defeated by Octavianus,) *Amphilochia*, *Dolopia* (which lay on the weſt ſide of the gulph de Larta,) *Moloſſia*, and *Athamania*, which was the ſeat of the *Dryopes*.

Thracia, now called Romania, was divided into Thrace *on this ſide* mount *Rhodope* (or Monte Argentaro) Thrace *beyond* mount *Rhodope*, and the *Thracian Cherſoneſus*,* now the Peninſula of Romania.

Thrace *on this ſide* Rhodope contained the provinces of *Mædica*, [or *Græcia Macedonica*] *Droſica*, *Sapaica*, *Corpialica*, (partly inhabited by the *Odryſæ*,) and *Urbana Provincia*, in which ſtood *Byzantium*, now called Conſtantinople from the emperor Conſtantine, who made it the ſeat of the empire; but the Turks call it *Stampolin*.

Thrace *beyond* the Rhodope contained the provinces of *Cænica*, *Selletica*, *Samaica*, (in which ſtood *Adrianopolis*, now Adrianople,) *Udiceſtica*, (in which was *Mons Hæmus*, now Monte de Coſtegnas or Cumoniza,) *Bennica*, *Beſſica*, *Dantheletica* and *Serdica*.

The *Thracian Cherſoneſus*, or modern peninſula of Romania, was otherwiſe called *Helleſpontiaca* and *Pallene*. In it ſtood the tower of *Seſtus*, or

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* *Cherſoneſus*, among the ancient Grecians and Romans, ſignified a peninſula.

Poſidonium, now the caſtle of the Dardanelles on the Europe ſide, and *Abydi Freta*, famous for the fatal loves of Hero and Leander. Theſe Streights were very frequently called the *Helleſpont*, from the princeſs *Helle*, who was drowned in them, after falling from the golden ram, in her flight from the cruelty of her ſtepmother: they are now called the ſtreights of Gallipoli. Part of the Cherſoneſus was likewiſe waſhed by the *Propontis*, or Sea of Marmora.

II. *Græcia Vera*, or Greece proper, was ſometimes called by the ancients, *Hellas*, *Achaia*, *Doris*, *Argos*, and *Argia*; and its inhabitants *Græci*, *Achæi*, or *Achivi*, *Dores*, *Argivi*, *Danai*, and *Pelaſgi*, and by the poets *Dolopes* and *Myrmidones*. It was divided into three parts; viz. *Achaia*, *Peloponneſus*, and the *Inſulæ*.

Achaia, or *Hellas*, contained ſeven diviſions; viz. 1. *Attica*, the dutchy of Setines, or Athens, in which were *Athenæ*, Setines, *Port. Phalereus*, Port-Leon or Tripyrghi, *Port. Munichia*, Muchina, *Port. Piræus*, Pireo, *Eleuſis*, Lepſina or Salina, *Acharnæ* between Attica and Bæotia, *Marathon*, Maraſona, *Phyle*, and *Decelia*, Eaſt of Athens, *Panormus*, Port Raphei, *Hymettus Mons*, Mount Hymetto, and *Sunium Promontorium*, Cape of Colonnas. 2. *Megaris*, Weſt of Athens, in which was *Megara*, now Megra or Mazarino. 3. *Bæotia*, North of Athens and Megara, in which were *Thebæ*, Stives, *Plateæ*, Platea, *Leuctra*, *Aſcra*, (Heſiod's native place,) *Chæronea*, (Plutarch's native place,) *Orchomenus*, Orchomeno, *Cithæron Mons*, Citherone, or Monte di Stiva, and *Helicon*, Mount Helicon. 4. *Phocis*, the diſtrict of modern *Livadia*, in which were *Parnaſſus Mons*, Parnaſſo, and *Delphi*, now Caſtri, [in which was the famous oracle of Apollo.] 5. *Doris* or *Tetrapolis*,

polis, north weſt of Phocis. 6. *Locris*, north of the gulph of Lepanto and weſt from *Phocis*. It's inhabitants were the *Locri Ozolæ*, to whom belonged *Naupactus*, the modern Lepanto; the *Locri Opuntii*, poſſeſſing the diſtrict of Talandi; and the *Locri Epicnemidii*, in whoſe territories were the celebrated *Thermopylæ*, a paſs from Macedon into Greece, only 25 feet broad, where the brave Leonidas withſtood an army of Perſians with only 400 of his gallant countrymen. 7. *Ætolia*, north and north weſt of the *Locri Ozolæ*. Through this country ran the famous river *Acheloüs*, now Aſpri.

Peloponneſus, a peninſula now called the Morea, contained *Achaia* in its northern part, *Argolis* in the eaſt and north eaſt, *Laconia*, and Meſſenia in the ſouthern, *Elis* in the weſtern, and *Arcadia* in the middle parts. Achaia contained *Corinthia*, whoſe capital was *Corinthus*, now Coranto, and its port *Cenchreæ* on the gulph of Lepanto; *Sicyonia*, in which was *Sicyon*, now Baſilica, the ancienteſt town in Greece, and *Nemea Fluv.* the river Angia; and *Achaia propria*, weſt of the two former. In *Argolis* were the city of Argos, now Argo, its citadel *Lariſſa*, *Mycenæ*, Agios Adrianos, *Nemea*, Triſtina, *Lerna*, Phonea, or Petrina, *Epidaurus*, Cherroneſi, and *Inachus Fluv.* the river Carmanor, or Haliacmon Planiza. In *Laconia* were *Cynoſura*, the Cape of Sidro, *Epidaurus Limera*, Malvaſia, *Aſopus*, Rampano, *Helos*, Palæopoli, *Tenarus*, Caibares, *Leuctra*, Maina, *Sparta* and *Lacedæmon*, Myſithra, and *Eurotas Fluv.* the river Iris or Baſilipotamo. In *Meſſenia* were *Methone*, Modon, *Pylus*, Navarin, (the city of Neſtor) *Ithome*,

Ithome, Grebegin, and *Pheræ*, Cheramidi. In Elis were the city of *Elis* with its harbour *Cellene*, now Antravida, *Pylus Eliacus*, Pylos, *Pylus Neſtoris*, Arcadia, *Olympia* or *Piſa*, Langanico or Stauri (near which the *Olympic* games were celebrated in honour of Jupiter Olympius, who had a celebrated temple in that city) *Erimanthus Mons*, Mount Dimizana, *Alpheus Fluv.* Alfeo, and *Peneus Fluv.* the river Igliaco. In *Arcadia* were *Megalapolis*, Leondario (the birth-place of Polybius) *Palantium*, or *Palas*, Muchli, *Nonacris* or *Stymphalus*, Vulſi or Longimaco, *Erimanthus*, Dimizana, *Cyllenius Mons*, Xyria, *Stymphalus Mons*, Mount Pogliſci, *Parthenius*, *Lycæus*, and *Cerauſius Mons*, the mountain Mitena.

The gulphs and bays round Peloponneſus were the *Sinus Corinthiacus* or *Delphicus*, the gulph of Lepanto, *Sinus Saronicus* or *Megaricus*, gulph of Engia, *Sinus Argolicus*, gulph of Napoli, *Sinus Laconicus*, gulph of Colochina, and *Sinus Meſſenius*, gulph of Coron.

Inſulæ, the Græcian Iſlands, were ſituated either in the *Ionian* Sea, or in the Archipelago, formerly the *Ægean* Sea.

The iſlands in the *Ionian* Sea were, *Corcyra*, or *Phæacia*, Iſle of Corfu, *Cephallenia*, or *Samos*, Cefalonia, *Zacynthus*, Zante, *Leucadia*, Santa Maura, *Echinades* or *Echinæ*, the Cozulari Iſles, *Ithaca* (the birth-place of Ulyſſes) Itache, Thiaci, or Val de Compara, *Dulichium*, Dulichio, *Thoæ Inſulæ*, Zorzoleo, the *Strophades*, Strivali, and *Sphacteria*, Sapienza.

The iſlands in the *Ægean* Sea were,

1. *Creta Inſula*, Crete, or Candia; in which was Minos's Labyrinth, ſome remains of which are ſtill to be ſeen at the foot of mount Pſiloriti,

and the cities *Gnoſſus*, Cynoſa, *Gortyna*, Gurtina or Metaria, *Cydonia* or *Apollonia*, Canea, *Lyſſus*, Pioniſſa, *Matium*, Candia, and *Camara*, Camera, the mountains *Dictæus*, or *Dictynnæus*, Sethia or Laſti, and *Ida*, Pſiloriti (where Jupiter was educated) and the river *Lethæus*, the Naporal.

2. *Eubæa*, the Negropont, in which were *Chalcis*, Negropont, *Eretria*, Eretria, and the *Euripus Chalcidicus* or *Euboicus*, the Streights of Negropont.

3. *Lemnos*, Stalimene, and the *Cyclades*, now the Archipelago iſles (called Cyclades from their circular poſition) the moſt noted of which was *Delos* or *Ortygia*, now Sdilles or Stile, which was ſaid to be the birth-place of Apollo and Diana, and was therefore conſecrated to thoſe Deities, but particularly to the former.

4. The *Sporades*, or ſcattered iſlands, among which were *Icaria*, Nicaria, and *Patmos*, Palmoſſa; and the *Thraciæ Inſulæ*, or iſlands off the coaſt of Thrace, among which was *Samos*, or *Samothrace*, now Samandrachi.

5. The *Inſulæ Macedonicæ*, or iſlands off the coaſt of Macedon, one of which was *Scyros*, Scyro; and the *Inſulæ Atticæ* off the coaſt of Attica, among which were *Salamis*, Coluri, and *Ægina*, Engia.

6. The *Inſulæ Peloponneſiacæ*, off the eaſtern coaſt of the Morea, one of which was *Cythera*, Cerigo.

IX. ITALY.

This celebrated part of Europe was known among the ancients by the names *Saturnia*, *Heſperia*, *Latium*, *Tyrrhena*, *Magna Græcia*, *Auſonia*, *OEnotria*,

tria, and *Italia.* It was divided into the northern part, the ſouthern part, and the ſurrounding iſlands.

I. The Northern Part of ITALY.

This was divided into *Gallia Ciſalpina*, *Thuſcia*, or *Etruria*, *Umbria*, *Sabinia*, and *Latium.*

Gallia Ciſalpina, called alſo *Citerior*, *Circumpadana*, or *Togata Gallia*, and *Italia Subalpina*, was bounded by the Var, the Alps, and the rivers Arno, Eſino, and Arſa, was divided into the following ſmall provinces; viz.

1. *Venetia*, which was inhabited by the *Hiſtri*, who poſſeſſed part of Iſtria and Friuli; the *Carni*, who poſſeſſed the eaſtern part of Friuli, a ſmall part of Iſtria, and the county of Goritz, in whoſe country was the *Fluv. Timavus*, the Timavo; and the *Veneti*, who poſſeſſed the weſtern part of Friuli, the Treviſano, Vicentin, Padouan, Dogado, beſt part of the Ferrareſe, and the Poleſin of Rovigo, in whoſe country was *Concordia*, or *Colonia*, Treviſo, *Vicetia*, Vicenza, *Patavium*, Padua, *Fluv. Padus*, the Po, *Fluv. Tartarus*, the Tartaro, and the *Aquæ Patavinæ*, near Abono.

2. *Pars Rhætiæ*, the Tretin, and Feltrin, in which was *Tridentum*, or Trent, where the famous council of Trent was held, which commenced A. D. 1545, and laſted eighteen years.

3. *Gallia Tranſpadana*, or beyond the Po, which was inhabited by ten different people, viz. the *Euganei*, who poſſeſſed part of the Breſſan, and Trentin, the Bergamoſco, and Valteline, and included the *Vennones*, Val Venoſca, *Triumphini*, Val de Tropia, *Camuni*, Val Communica, *Stæni*, near Stor, *Raguſci*, in the Trentin, *Suanetes*, near Vill. Zuan, *Brixentes*, near Brixen,

and *Calucones*, near Engadin; the *Cenomani*, who poſſeſſed great part of the Veroneſe, part of the Mantuan, of the Breſſan, and of the Cremoneſe, in which were *Cremona*, *Mantua*,* and *Verona*, (ſtill the ſame) and *Fluv. Mincius*, the Menzo; the *Orobii*, who poſſeſſed the part of Milan in the neighbourhood of Como, in which was *Comum*, Como, the birth-place of the younger Pliny; the *Inſubres*, who poſſeſſed part of the Duchy of Milan, the Cremaſco, and part of the Cremoneſe, in which were *Mediolanum*, Milan, and *Acerræ*, Gherra; the *Lævi*, who poſſeſſed the country of Pavia and Novarra, in which were *Ticinum*, Pavia, and *Fluv. Ticinus*, the Teſſin; the *Libicii*, who poſſeſſed the Lordſhip of Verceilles, Laumellina, and part of Montferrat; the *Lepontii*, part of Switzerland, and of Milan, near Lake Major; the *Salaſſi*, the valley of Aoſt, and part of Piedmont; the *Taurini*, great part of Piedmont beyond the Po, and part of the Marquiſate of Saluſſes, in which was *Tauraſia*, or *Taurinum*, Turin; and the *Seguſini*, part of Piedmont and Dauphine, in which were *Ocellum*, Exilles, and *Mons Veſulus*, Monte Viſo.

4. *Gallia Ciſpadana*, or Gaul on this ſide the Po, contained four people, viz. the *Anamani*, poſſeſſing the Duchy of Piacenza, Principality of Landi, Palavicini, and part of Parmeſan, in whoſe country was *Placentina*, Piacenza, and *Fluv. Trebia*, the Trebbia; the *Boii*, great part of Parma, Dutchies of Reggio and Modena, Corregio, Mirandula, la Frignana, part of Mantua ſouth of the Po, and of the Bologneſe and Ferrareſe,

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* *Mantua* was the birth-place of Virgil, the prince of the Latin poets.

rareſe, in whoſe country were *Parma*, Parma, *Mutina*, Modena, and *Bononia*, Bologna; the *Lingones*, part of the Bologneſe, and of la Romagna; and the *Senones*, the weſtern part of *Romagna*; in which was *Ravenna*, Ravenna, and *Fluv. Rubicon*, the Fiumecino, which Cæſar croſſed when he openly commenced the civil war.

5. *Liguria* was inhabited by the *Ligures Capillati*, who poſſeſſed part of the county of Nice, the lordſhip of Mourgues, and all the coaſt of Genoa; and the *Ligures Montani*, who poſſeſſed part of the Marquiſate of Saluſſes, of Piedmont, Montferrat, and the Milaneſe. The former were divided into the *Vediantii*, *Intemelii*, *Ingauni*, and *Ligures Veri*; and the latter into the *Vagienni*, *Statielli*, and *Veliates Vechelii*, two of whoſe towns were *Velia*, unknown, and *Claſtidium*, Chiaſteggio.

TUSCIA OR ETRURIA was divided into *Tuſcia trans Arnum*, which lay between the Magra and the Arno; and *Tuſcia cis Arnum*, which lay between the Arno and the Tiber.

Tuſcia trans Arnum was inhabited by the *Ligures Apuani*, now the inland territories of Genoa, the Val di Magra, the Duchy of Carrera, the ſtate of Lucca, and part of the Piſan.

Tuſcia, or *Etruria cis Arnum*, was inhabited by twelve people, viz.

The *Volaterrani*, poſſeſſing the greateſt part of the Piſan, in which was *Volaterræ*, now Volterra:

The *Vetulonii*, part of the Piſan and of Piombino, in which was *Vetulonii*, Vetulia, near Capiglia:

The *Ruſellani*, the Dutchy of Caſtro, and part of the Sienneſe, in which was *Ruſellæ*, Moſcoua:

The *Tarquinii*, part of the patrimony of St. Peter, near the Dutchy of Caſtro, in which was *Tarquinii*, Tarqueno:

The *Ceratani*, part of the patrimony of St. Peter, from the Lake Bracciano to the Tuſcan Sea, in which ſtood *Cære*, or *Cerete*, Cerveteri:

The *Veientes*, Dutchy of Parma, part of the patrimony of St. Peter, towards Rome and Porto; their cities were *Veii*, Scrofano, and *Sutrium*, Sutri:

The *Volſinii*, part of the patrimony of St. Peter, about Bolſena and Monte Fiaſcone, and ſome part of Sienna; in their territory ſtood *Volſinii*, Bolſena, and *Ferentinum*, Ferenti:

The *Faliſci*, or *Falerii*, the country round Mount Sylveſter, and Citta Caſtellana, where ſtood *Falerii*, near Citta Caſtellana, and *Capena*, Civitella:

The *Cluſini*, part of Sienna, and Orvieto, in which ſtood *Cluſium*, Chiuſi:

The *Arretini*, part of the country about Florence and Arezzo; their chief towns were *Arretium*, Arezzo, and *Fæſulæ*, Fieſoli:

The *Cortonenſes*, part of the Florentin above the Lake of Perugia; their chief town was *Cortona*, Cortona: and

The *Peruſini*, great part of the territory of Perugia, containing *Peruſia*, Perugia, and *Lacus Thraſymenus*, the Lake of Perugia.

UMBRIA was divided into *Umbria trans Apenninum*, inhabited by the *Vilumbri*; and *Umbria cis Apenninum*, inhabited by the *Olumbri*.

The *Umbria trans Apeninnum* was part of Romagna, Romagna Florentina, moſt of Urbino, the territory of Fano, and part of the Marquiſate of Ancona. It's moſt remarkable towns, &c.

were *Ariminium*, Rimini, *Piſaurum*, Peſaro, *Camerinum*, Camerino, *Tifernum Metaurenſe*, St. Angelo in Vado, *Sarſina*, Sarſino, (Plautus's birth place) *Fluv. Ariminus*, the Marechia, and *Fluv. Piſaurus* or *Iſaurus*, the Foglia.

The *Umbria cis Apenninum* was part of the Dutchy of Urbin, and of the territory of Perugia, the county of Citta Caſtellana, and moſt of the Dutchy of Spoleto. It's towns, &c. were *Tifernum Tiberinum*, Citta-di-Caſtello, *Iguvium*, Eugubio, *Fulginium*, Foligno, *Nuceria Camellaria*, Nocera, *Carſulæ*, Caſſigliano, *Ameria*, Amelia, *Interamna*, Terni, *Fluv. Glitumnus*, the Clitonno, and *Fluv. Nar*, the Negra.

SABINA was divided into the *Sabini trans Velinum*, and the *Sabini cis Velinum*. The former contained part of the Dutchy of Spoleto, and of the farther Abruzzo, and it's towns, &c. were *Reate*, Rieti, *Nurſia*, Norcia, *Palanteum*, Polegia, *Amiternum*, La Peſcara, and *Fluv. Velinus*, the Velino.

The latter was the modern Sabina, and contained *Cures*, Coreſe, *Eretum*, Monte Rotundo, *Caſperia*, Aſpra, *Cruſtumerium*, Marcigliano Vecchio, *Anio Fluv.* the Teverone, *Allia Fluv.* the Caminato, or Ria di Moſſo, *Fabaris* or *Farfarus Fluv.* the Farſa, *Himella Fluv.* the Aia, *Antemna*, *Cænina*, *Fidenæ*, *Corniculum*, all unknown, *Collatia*, St. Agneſe, *Ficulnea*, Church of St. Vaſile, *Nomentum*, Lamentano, and *Lacus Regillus*, Lago di S. Proſſode.

LATIUM contained *Roma*, *Latium* proper, the *Rutuli*, *Volſci*, *Aurunci*, *Henrici*, and *Æqui*.

Roma, the city Rome, was divided into fourteen regions or wards, and ſtood upon ſeven hills, viz. *Mons Palatinus*; *Mons Tarpeius* or

Capitolinus, whereon ſtood the capitol; *Mons Cœlius*, whereon now ſtands the church of St. John di Lateran; *Mons Eſquilinus*, on which is the church of St. Mary de Nivibus; *Mons* or *Collis Quirinalis*, Monte Cavallo; *Mons Viminalis*; and *Mons Aventinus*, on which ſtands St. Sabina's church. The *Janiculum*, Montorio, was taken in afterwards. This renowned city, once the miſtreſs of the world, was built by Romulus, from whom it borrowed it's name, and was afterwards deſervedly admired for it's numerous and magnificent gates, public roads and bridges, and it's coſtly and ſtupendous aqueducts.

Latium was part of the Campagna di Roma, between Tivoli, Veletri, Rome, and the river *Numicus*, or Di Nemi. It's towns, &c. were *Oſtia*, Oſtia, *Laurentum*, San-Lorenzo, *Lavinium*, near St. Petronilla's chapel, *Lanuvium*, Civita Lavina, *Aricia*, Aricia, *Alba Longa*, on Mount Albano, *Tuſculum*, Freſcati, *Tuſculanum Ciceronis*, the Monaſtery of St. Maria di Grotta Ferrara, *Gabii*, Hoſteria di Finochio, *Tibur*, Tivoli, *Præneſte*, Paleſtrina, *Lacus Regillus*, the Lake of St. Praxeda, or Proſſode, *Tiberis Fluv.* the Tiber, *Anio Fluv.* the Teverone, and *Numicus Fluv.* the Nemi, or Numico.

The *Rutuli* inhabited the maritime part of Campagna di Roma, betwixt the Numicus and Cape of Antium; and their cities were *Ardea*, Ardea, and *Aphrodiſium*, or *Templum Veneris*, near St. Anaſtaſia.

The *Volſci* had great part of the Campagna di Roma, from Paſiano, the Cape of Antium Velitri, and part of the Terra di Lavora. Their cities were *Antium*, Antio Rouinata, *Aſtura*,

Aſtura, (the place where Cicero was aſſaſſinated) *Terracina*, and *Anxur*, Terracina, *Privernum*, Piperno, *Sulmo*, Sermoneta, *Norba*, Norma, *Velitræ*, Velitri, *Tres Tabernæ*, Ciſterna, *Forum Appii*, near San Donata, *Fregellæ*, Ceperaro, *Interamna*, near Monte Corvo, *Caſinum*, Monte Caſſino, *Arpinum*, Arpino, (the birth-place of C. Marius, and Cicero) *Atina*, Atino, *Sora*, Sora, *Liris Fluv.* the Garigliano, and *Ufens Fluv.* the Auſento.

The *Aurunci*, or *Auſones*, inhabited part of the Terra di Lavoro, from Terracina to the Liris, and beyond it. Their principal towns, &c. were *Amyclæ*, deſtroyed, *Fundi*, Fondi, *Formianum*, Villa di Cicerone, *Formiæ*, Mola, *Minturnæ*, deſtroyed, *Maſſicus Mons*, Monte Dragone, *Cæcubum Ager*, noted for its rich wines, and *Triſanum* and *Sinueſſa*.

The *Hernici* contained the country of Anagni, and Alatro, in the Campagna di Roma; and their principal towns were *Anagnia*, Anagni, and *Ferentinum*, Ferentino.

The *Æqui*, or *Æquicoli*, were part of the Campagna di Roma, in the neighbourhood of Subiaco. Their remarkable towns were *Algidum*, Oſteria, *Corbio*, near the former, *Carſeoli*, Arſoli, and *Bola*, deſtroyed.

II. The Southern Part of ITALY.

The Southern Part of Italy comprehended *Samnium*, *Campania*, and *Magna Græcia*.

SAMNIUM was divided into eight parts, viz.

The *Picentes*, who inhabited part of the Marquiſate of Ancona, and of the farther Abruzzo. Their chief towns were, *Ancona*, Ancona, *Cingulum*,

gulum, Cingolo, *Faleria*, Faleroni, and *Picenum*, near Fermo.

The *Veſtini*, who inhabited part of the farther Albruzzo. In their country was *Amiternum*, Amiterno.

The *Marrucini*, who inhabited the diſtrict of Chieti in the hither Abruzzo. Their chief town was *Reate*, Chieti.

The *Frentani*, who inhabited part of hither Abruzzo, and the Capitanata. In their country was *Larinum*, Larina.

The *Peligni*, who inhabited part of the hither Abruzzo, round Sulmo, between the Peſcara and the Sangro. Their chief towns were *Corfinium*, near Popolo and Petinia, and *Sulmo*, Sulmona.

The *Marſi*, who inhabited part of the hither Abruzzo about the lake Celano. In their country was *Marruvium*, Mornea, and *Fucinus Lacus*, the lake of Celano.

The *Samnites*, who inhabited part of the hither Abruzzo, the county of Moliſſa, part of the Capitanata, and of the Terra di Lavora. Their chief towns, &c. were *Maleventum* (afterwards called by the Romans *Beneventum*) Benevento, *Aufidena*, Alfidena, *Caudium*, Airola, and *Furcæ Caudinæ*, between Airola and St. Agatha.

The *Hirpini*, who inhabited Principato ultra. Their towns, &c. were *Æcæ*, Trevico, *Calliſæ*, Cariſe, *Rufæ*, Ruvo, *Aquilonia*, Carbonara, *Compſa*, Conza, and *Aufidi Fons*, the ſource of the *Aufidus*, or Lofanto.

CAMPANIA was inhabited by the *Campani* and *Picentini*.

The *Campani* poſſeſſed a part of Terra di Lavora. Their chief towns, &c. were *Sinueſſa*, near Bagni, *Cumæ*, Cuma, near which was the cave of the Cuman Sibyl, *Baiæ*, Caſtello de Baia, *Puteoli*, Puzzoli, *Neapolis*, Naples, *Herculaneum*, Torre del Greco, *Surrentum*, Sorrento, *Capua*, two miles from the preſent Capua, *Caſilinum*, near old Capua, *Cales*, Calvi, *Calatia*, Caiazzo, *Alliſæ*, Alifi, *Teanum Sidicinum*, Tiano, *Venafrum*, Venafro, *Nola*, Nola, *Abella*, Avella Vecchia, *Vulturnus Fluv.* the Voltorno, *Lacus Avernus*, the Lake Averno, *Maſſicus* or *Falernus Mons*, Monte Dragone, and the burning mountain *Veſuvius*, Monte di Somma.

The *Picentini* inhabited part of the hither Principato; and their chief town was *Picentia*, now Vicenza.

MAGNA GRÆCIA was divided into *Apulia*, and *Oenotria*.

Apulia was divided into *Apulia Daunia*, *Apulia Peucetia*, and the *Meſſapia*.

1. *Apulia Daunia* comprehended Puglia Piana, or the part of the Capitanata between the Fortore and the Cervaro. Its moſt remarkable towns were *Teanum Apulum*, Teani, and *Arpi*, Arpe or Larpe.

2. *Apulia Peucetia* contained the other part of the Capitanata between the Carvaro and the Ofanto, the territory of Bari, part of the Baſilicata, and of Otranto. It's moſt remarkable rivers, towns, &c. were *Aufidus Fluv.* the Ofanto, *Cannæ*, Canna, *Canuſium*, * Canoſa,

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* The inhabitants of Canuſium ſpoke a ſort of mixed language, partly Greek, and partly Latin; whence that paſſage of Horace,

Canuſini more bilinguis.

Sat. I. 10. 30.

Aſculum, Aſcoli, *Acherontia*, Chirenza, *Venuſia*, Venoſa (where Horace was born) and *Vultur Mons*, part of the Apennine.

3. *Meſſapia*, or *Calabria*, was divided into the *Salentini*, and *Calabri*.

The *Salentini*, or *Meſſapii veri*, inhabited part of Otranto on this ſide of the Apennine. Their moſt remarkable places were *Tarentum*, Taranto, *Manduria*, Mandola, and *Salentum* or *Salentia*, Soleto.

The *Calabri* inhabited part of Otranto beyond the Apennine. Their remarkable places were *Brunduſium*, Brundiſi, *Hydrus*, Otranto, and *Caſtrum Minervæ*, Caſtro.

OENOTRIA was divided into the *Lucani* and *Bruttii*.

The *Lucani* inhabited part of the hither Principato of Calabria citerior, and of the Baſilicati. They were divided into thoſe who lived on this ſide the Apennine, and thoſe who dwelt beyond it.

The remarkable places belonging to the former (whoſe country was likewiſe called *Regio Poſidoniatum*) were *Velia*, Caſtel a Mare della Brucca, *Palinurus Portus*, Palinuro, *Buxentum*, Polycaſtro, or Piſciota, *Blanda*, Blanes, and *Palinurum Promontorium*, the Cape of Palinuro.

In Lucania beyond the Apennine (which was likewiſe called *Ditio Sybaritarum*) were *Metapontum*, Torre di Mare, *Thurium*, Sybari Rouinata, *Grumentum*, Clarimonte, and *Sybaris*, Cochile.

2. The *Bruttii* inhabited part of the lower or further Calabria, and a ſmall part of the hither. They were divided into the *Ciſmontani*, and *Tranſmontani*.

In the territories of the former were *Pandoſia*, Mondicino, *Temeſe*, Torre Loppa, *Vibo Valentia*, Monte Leone, *Metaurum*, Oppido, *Rhegium Julium*, Rheggio, *Brutium*, Ponta della Saetta, and *Acheron Fluv.* the Fanar.

In the territories of the former, who were anciently called *Locri*, or *Crotoniatæ*, were *Beſidiæ*, Beſignano, *Petilia*, Belcaſtro, *Croton* or *Crotona*, Cortona, *Caſtra Hannibalis*, Caſtelli, *Caulon*, Caſtro-vetere, *Locri Epizephirii*, Gierazzo, *Peripolium*, Mandolaia, *Sinus Scylaceus*, the gulph of Squillati, *Sinus Locrenſis* or *Bruttius*, the gulph of Girazzo, and *Sinus Tarentinus*, the gulph of Tarento.

III. Of the ITALIAN ISLANDS.

The Italian iſlands were,

1. Thoſe off the coaſt of *Apulia*, or Capitanata.
2. Thoſe off the coaſt of *Lucania*, or Baſilicata, and Calabria Citerior.
3. Thoſe off the coaſt of *Campania*, or Terra di Lavora.
4. Thoſe off the coaſt of *Latium*, or Campagna di Roma.
5. Thoſe off the coaſt of *Etruria*, or Tuſcany.
6. *Corſica* in the Mediterranean, between Sardinia and Italy, and about 280 miles in circumference. It formerly contained a number of cities.
7. *Sardinia*, in the Tuſcan. ſea, about 140 miles long, and 60 broad. It was formerly ſo fruitful in corn and wine, that it was reckoned one of the granaries of Rome. There are many ſmall iſlands round it.
8. SICILY, the largeſt of the Italian iſlands,

and ſituated in the Mediterranean. It was anciently called *Sicilia*, *Sicania*, *Trinacria*, (on account of its triangular ſhape) *Ennæa*, *Vulcania Inſula* *, and *Ætnæa Tellus*. It's length is about 170 miles, and it's breadth 100; and it is ſeparated from *Lucania* in Italy by the Streight or Pharo of Meſſina, which is only ſeven miles over in the narroweſt part, and 12 or 15 at the uſual paſſage.

In the northern part of *Sicilia*, from *Pelorum Promontorium* to *Lilybæum Promontorium*, were *Himera*, Termini, *Panormus*, Palermo, *Eryx*, Trapano Vecchio, *Drepanum*, Trepano, *Pelorus* or *Pelorum Promontorium*, Cape di Faro, and *Simois*, or *Scamander Fluv.* the river of St. Bartholomeo.

In the ſouthern part of Sicily, from *Lilybæum Promontorium*, Cape Coco, to *Pachynum Promontorium*, the Cape of Paſſaro, were *Lilybæum*, Marſala, *Heraclea Minoa*, Heraclea, *Agrigentum*, Gergenti, *Camerina*, Terra de Camerana, and *Pachyni Portus*, Motya.

In the eaſtern part of Sicily, from *Pachynum Promontorium* to Meſſina, were *Elorum*, Baiocheno, *Syracuſæ*, Syracuſe, *Catana*, Catanea, *Ulyſſis Portus*, Torre Lognina, *Naxus*, at the mouth of the Frigidi, *Taurominium*, Taormina, *Meſſana*, Meſſina, and *Drepanum*, Cape of St. Aleſſio.

In the inland part of Sicily were *Eryx*, Trapani del Monte, *Segeſta* or *Ægeſta*, Barbara,

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* So called, becauſe one of Vulcan's ſhops was ſaid to be in Mount Ætna, where he was aſſiſted by the *Cyclopes*, or one-eyed giants, the moſt noted of whom was *Polyphemus*.

Apollonia or *Galata*, Galata, *Ætna Urbs*, Maſcali, *Hybla Major*, Paderno, *Leontium* or *Leontini*, Lentini, and *Ætna Mons*, Monte Gibello, a burning mountain much larger than *Veſuvius*, its baſon or cavity being about ſix miles in circumference, and its bottom about ſeventy miles. According to the poets, Jupiter confined the rebellious giants in this dreadful cavern, after he had driven them from the battlements of heaven by his thunder-bolts. In this part of the country likewiſe were the *Montes Hyblæi*, which were famous for affording the fineſt honey in the world: whence came the epithets *Hyblææ apes*, Hyblæan bees, and *Hyblæa mella*, Hyblæan honey, to denote the beſt of the kind.

CHAP. III.

ASIA.

ASIA was by far the largeſt of the three continents known to the ancients, and was parted from *Europe* by the river *Tanais*, or Don, and from *Africa* by the Red Sea and iſthmus of Suez. We ſhall conſider it as it may be divided into the northern, weſtern, and ſouthern parts.

I. The Northern Part of ASIA.

The *northern* part of *Aſia* (which is the leaſt known even to this day) may be divided into *Sarmatia*, *Scythia*, *Serica Regio*, and *Terra ſeptentrionalis incognita*.

Sarmatia, otherwiſe called *Sauromatia*, was bounded on the weſt by the *Pontus Euxinus*, *Palus Mæotis*, and *Tanais*, (that is, the Black Sea, the Sea of Zabacche, and the Don;) on the north by the river *Rha*, or Volga; on the eaſt by the ſame river, and part of the Caſpian Sea; and on the ſouth by the *Caucaſus*, or Mount Elbours: ſo that it contained part of Muſcovy in Aſia, Aſtracan, Circaſſia, Georgia, Caſan, and Siberia. That part of Circaſſia next to the Sea of Zabacche was inhabited by the *Mæotæ*, or *Mæotidæ*, from whom that ſea was called the *Palus Mæotis*. The *Amazones*, it is ſaid by ſome, inhabited part of the country, which lies between the Wolga and Mount Mazariſc.

The *Tanais*, one of the rivers of this extenſive country, diſcharges itſelf into the *Palus Mæotis*; and the *Rha*, another of its rivers, runs into the Caſpian Sea.

The noted mountains in Sarmatia (beſides the *Caucaſus* already mentioned) were the *Montes Ceraunii*, Monti de Chimera.

Scythia was a general name for the northern parts of *Aſia*, and ſome of the adjoining ones of *Europe*: and it was divided into *Scythia intra Imaum*, or within Mount Imaus, [a mountain in Great Tartary,] and *Scythia extra Imaum*.

Scythia intra Imaum contained the Turqueſtan, and the adjoining part of Great Tartary.

Scythia extra Imaum comprehended the Mongul and Calmuck Tartars.

Serica *Regio* was inhabited by the *Seres*, who, according to ſome, were the Bogdoi Tartars; according to others, the kingdom of Cathay, and northern part of China; and, according to others, the kingdom of Tangut and Niuche.

Terra *Septentrionalis Incognita*, Northern or Muſcovite Tartary, was inhabited by the *Hyperborei Scythæ*. In this country were the *Montes Riphæi*, the Mountains of Stolpe or Oby.

II. The Weſtern or Middle Part of Asia.

The weſtern or middle part of *Aſia* was divided into *Aſia Minor*, *Syria*, *Armenia*, *Arabia*, and the *Perſian* or *Parthian* empire.

I. Asia Minor.

Asia Minor, now called Natolia, was divided into the following provinces.

I. Mysia, divided into *Myſia Minor*, and *Myſia Major*.

Myſia Minor was bounded on the N. E. by the river *Rhyndacus*, on the S. by *Troas*, and on the W. by the Helleſpont and part of the Propontis. It's remarkable places were, *Cyzicum*, Chizico, *Lampſacus*, Lampſico, *Dindymus Mons*, near Chizico, *Rhyndacus* or *Lycus Fluv.* the Artacho, and *Granicus Fluv.* the Lazzara, where Darius's troops were firſt defeated by Alexander the Great.

Myſia Major was bounded on the S. by the river *Caicus*, on the N. by the Scamander, on the W. by part of the Ægean Sea, and on the E. by Aſia Proper. It's remarkable places were *Pergamum*, Pergamo, *Adramyttium*, Landrimiti, *Antandros*, San Dimitri, *Thyatira*, or *Semiramis*, *Fluv. Caicus*, the Girmaſti, and *F. Scamander*, the Palæſcamandria.

II. Troas, the land of Troy, lay between the two *Myſias*, on the weſt, along the coaſt of the Ægean Sea. It's moſt remarkable places were *Abydus*, the caſtle of the Dardanelles in

Aſia; *Dardanium*, from which the Trojans were called *Dardani*; *Rhetæum*; *Sigeum*, Janizzari, near which was the tomb of Achilles; *Troja*, or *Ilium*, TROY; Lariſſa; *Mons Ida*, in the middle of Troas; the *Scamander* or *Xanthus*, Palæſcamandria; *Fluv. Simois*, which runs into the Scamander; and *Granicus*, the Lazzara.

III. ÆOLIA (ſo called becauſe it was a colony of the *Æoles* in Greece) was bounded on the N. and S. by the rivers *Caicus* and *Hermus*, on the E. by *Aſia propria*, and on the W. by part of the Ægean Sea. In it were *Cumæ*, Caſtri; Lariſſa; *Attalia*; part of the *Caicus*; and *Fluv. Hermus*, the Sarbat.

IV. IONIA (firſt peopled by the ancient *Iones* in Greece) lay along the Archipelago, between the *Hermus* and *Meander*. In it were *Smyrna*, Smirna; *Clazomenæ*, Grine; *Teos* or *Teios*, Suſor; *Epheſus*, Epheſus; *Magneſia*, Magneſia; the *Pactolus*, which runs into the *Hermus*; the *Cayſtrus*, or Chiaci; and the *Mæander*, the Madre.

V. CARIA was bounded by the Mæander, the Lycus, the Xanthus, the Calbis, and part of the Archipelago. In it were *Miletus*; *Halicarnaſſus*, Halicarnaſſus; and *Cnidus*, Cio, or Cape Erio.

VI. LYCIA was bounded by Caria, Piſidia, Pamphilia, and the ſea-coaſt. In it were *Telmeſſus*, *Cydna*, and the river *Xanthus*.

VII. LYDIA, or *Mæonia*, was bounded by Ionia, the *Hermus*, the *Caiſtrus*, and Mount *Sipylus*. In it were *Sardes* or *Sardis*, Sardo; *Thyatira*, Ak-Hiſſar; *Philadelphia*, Philadelphia; *Nyſa*; *Tralles*; and *Nicopolis*.

VIII. PHRYGIA, called *Phrygia Magna*, lay in the center of *Aſia Minor*. In it were *Ancyra*, *Gordium*,

Gordium, *Euphorbium*, *Coloſſæ*, Chone, *Laodicæa*, and *Hierapolis*.

IX. GALATIA, or *Gallo-Græcia*, a colony of Gauls, was bounded on the S. by Phrygia, and on the other ſides by Bithynia, Paphlagonia, and Cappadocia. In it were the famous *Mons Olympus*, *Mons Dindymus*, and *Fluv. Parthenius*.

X. BITHYNIA was bounded by the *Rhyndacus*, part of the *Propontis*, part of the Black Sea, the river Parthenius, and part of *Aſia propria*. In it were *Pruſias*; *Nicomedia*, *Comidia*, or *Nicor*; *Chalcedon*, Scutari; *Nicæa*, Iſnich, famous for its two general councils; *Libyſſa*, where Hannibal died and was buried; and *Cæſarea*.

XI. PAPHLAGONIA was bounded by the *Parthenius* and *Halys*, and part of Galatia, and of the Euxine Sea. In it were *Sinope*, and *Fluv. Halys*, the Caſilirmar.

XII. PONTUS was bounded on the N. by the Euxine or Black Sea, on the E. by *Armenia Minor*, on the S. by Cappadocia, and on the W. by Galatia and Paphlagonia. Here dwelt the famous *Amazons*; and *Mithridates*, who carried on ſo long a war againſt the Romans, was king of this country. One of its moſt remarkable towns was *Trapezus*, Trebiſond, which was founded by the Greeks.

XIII. CAPPADOCIA lay on the S. ſide of *Pontus*. In it were *Nyſſa*, *Cæſarea*, and *Tyana*, the native place of Apollonius Tyanæus, the pretended magician.

XIV. CILICIA was bounded on the N. by Mount *Taurus*, on the S. by the Mediterranean, on the E. by the river Pinarus, and on the W. by Pamphylia. In it were *Cydnus*; *Soli*, or *Soloe*[*] ; *Tarſus* ; *Iſſus*, Giazza ; *Philadelphia* ; *Sarpedon* ; *Pinarus Fluv.* the Malmiſtra ; *Cydnus Fluv.* which ran through Tarſus ; the *Pylæ Ciliciæ*, *Pylæ Tauri*, and *Pylæ Amanides* or *Amanicæ*, certain paſſes or defiles over the mountains.

XV. ISAURIA, a craggy, mountainous country, at the foot of Mount Taurus, was bounded by Cilicia, Lycaonia, Piſidia, Pamphylia, and the ſea. The river *Calydnus* ran through part of this country, and one of its towns was *Clibanus*.

XVI. PAMPHYLIA lay along the ſea ſhore, on the S. of Piſidia and Iſauria, between the river Melas and Mount Climax. In it was *Lyrneſſus*, from whence Achilles took *Briſeis*.

XVII. PISIDIA was bounded by Caria, Phrygia, Lycaonia, Cilicia, Iſauria, and Pamphylia. In it was *Antiochia*, mentioned in the Acts of the Apoſtles, but not the famous Antioch.

XVIII. LYCAONIA was bounded by Cilicia, Cappadocia, Galatia, Phrygia, and Piſidia. In it were *Lyſtra* ; *Iconium*, Cogni ; and *Derbe*.

The WESTERN ISLANDS of Aſia Minor were *Tenedos*, Tenedo; *Leſbos*, Metelin, in which ſtood *Mitylene* ; *Chios*, Scio ; *Samos*, Samo ; *Patmos*, Palmoſa ; *Cos*, Cos ; and *Rhodus*, Rhodes [†].

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[*] This was the birth-place of Aratus, Chryſippus the philoſopher, and Philemon the comic poet. Solon is ſaid to have been the founder of it; and to have peopled it with a colony of Athenians, who, ſoon forgetting the purity of their native language, gave occaſion to the Greeks to call every corruption in ſpeech a Solœciſm.

[†] Rhodes was famous for a *coloſſus*, or brazen ſtatue of Apollo, 70 feet high, accounted one of the wonders of the world.

On the SOUTHERN ſide in the Levant was the Iſland of *Cyprus*, conſecrated to Venus.

II. SYRIA.

SYRIA, at preſent known by the name of *Souria*, was divided into *Syria* proper, *Phænice*, and *Paleſtina*.

SYRIA PROPER was bounded on the N. by the Mounts Taurus and Amanus, on the W. by the Mediterranean, on the S. by Arabia Deſerta, and on the E. by the Euphrates, and was divided into *Commagene*, &c. as follows,

1. *Commagene* was the moſt northern part of Syria, lying between the Euphrates, and the Mounts Taurus and Amanus. It's capital was *Samoſata*, Scemplat, the birth-place of Lucian.

2. *Seleucis*, and *Pieria*, were two little provinces on the S. of Commagene, and running W. of *Cyrrheſtica*, along part of the coaſt of the Mediterranean, as far as the river *Eleutherus*. In it were *Melibæa Inſula*, at the mouth of the Orontes, famous for dying ſcarlet; *Antiochia*, the capital of all Syria, where the diſciples of our Lord were firſt called Chriſtians; and *Daphne*, a place much reſorted to for its delightful ſituation, and the many pleaſures it afforded: whence the phraſe, *Daphnicis moribus vivere*.

3. *Cyrrheſtica* was bounded by the Euphrates, the above-mentioned provinces, and Chalcidene.

4. *Chalcidene* was a ſmall province on the S. of Cyrrheſtica.

5. *Palmyrene* was bounded by Chalcidene, Cælo-Syria, Arabia, and the Euphrates. In it were *Thapſa*, mentioned in 1 Kings xiv. 24. and

Palmyra or *Tadmor*, Theudemor, the noble ruins of which are ſtill to be ſeen.

6. *Cælo-Syria* was bounded by Palmyrene, Arabia, Mount Libanus, and the Orontes and Marſyas. It's capital was *Damaſcus*, Damaſcus, or Scham.

Phenicia, formerly much noted for it's extenſive commerce, was bounded on the N. by the river *Eleutherus*, on the E. by Cælo-Syria, on the S. by Paleſtine, and on the W. by the Mediterranean. It's remarkable places were *Sidon* or *Zidon*, Sayd; *Sarepta* or *Zarpath*; *Tyrus*, Sur, which ſtood in an iſland or peninſula; *Tyrus vetus*, on the continent, and deſtroyed by Nebuchadnezzar; *Eleutherus Fluv.* the Villana; and *Adonis Fluv.* the Canis, which was ſaid to turn bloody every year during the feſtival kept in honour of Adonis.

Palestine, or the *Land of Canaan*, before it's conqueſt by the Jews, was divided into ſeveral petty kingdoms; after the conqueſt, into twelve tribes; after the death of Solomon, into the kingdoms of *Judah* and *Iſrael*; and about the birth of Chriſt, into ſeveral petty ſtates or royalties, which ſoon became provinces of the Roman empire. This country and its confines will be more particularly deſcribed in the Appendix, containing an Abſtract of Sacred Geography.

III. ARMENIA, and its Confines.

This extenſive country was divided as follows.

1. Into *Armenia Major*, which was bounded on the S. by Mount Taurus, on the E. by Media,

dia, on the N. by Iberia and Albania, and on the W. by Armenia Minor. It is now called Turcomania; and its remarkable places were *Artaxata*, the metropolis, now Choin; *Tigranocerta*, Sultania; *Lagerda*; the rivers *Euphrates* and *Tigris*, which riſe in Armenia, and fall into the Perſian Gulph; the *Araxes*, the Arais, which falls into the Caſpian Sea; and *Gordiæus Mons*, or Mount Ararat.

2. *Armenia Minor*, bounded on the N. and W. by the *Taurus* and *Antitaurus*, on the S. by Syria, and on the E. by the Euphrates, which parted it from *Armenia Major*.

3. *Albania*, bounded on the N. by the mountains *Caucaſii* and *Ceraunii*, on the E. by the Caſpian Sea, on the S. by *Cyrus Fluv.* and Armenia Major, and on the W. by Iberia. It is now called *Georgia*, or, according to ſome, the provinces of *Schirwan*, and *Erivan* in Perſia.

4. *Iberia*, now Imerita, lying E. of the Euxine Sea.

5. *Colchis*, now Mingrelia, having the Euxine Sea on the W. In it were the river and city *Phaſis*, now *La Phaſe*.

6. The *Boſphorani*, the Circaſſians on the N. coaſt of the Euxine, as far as *Boſphorus Cimmerius*, or the Straits of Caffa.

7. The *Mæotæ*, the weſtern Circaſſians along the Palus Mæotis from the Straits of Caffa, as far as the mouth of the *Tanais*, or Don.

IV. ARABIA.

ARABIA was bounded on the N. by Paleſtine, Syria, and the Euphrates, and ſurrounded on the other ſides (as it is at preſent) by ſea. It alſo was, as it now is, divided into three parts, viz.

1. *Arabia Petræa*, ſo called from its rocky ſoil; but named at preſent *Baraab* or *Barthalaba*. It lay eaſt of the Iſthmus of Suez, and along the eaſtern coaſt of the Red Sea, oppoſite to Egypt. It's inhabitants were the *Ammonites*, *Moabites*, *Mideanites*, *Iſhmaelites*, *Hagarenes*, *Edomites*, or *Idumeans*, and *Amalekites*; and it contained the famous Mountains *Horeb* and *Sinai*, the laſt of which isnow called St. Catharine's Mountain, and by the Arabians *Gibel Mouſa*.

2. *Arabia Deſerta*, ſtill ſo called, bounded on the N. by the Euphrates, on the W. by Paleſtine, Arabia Petræa, and part of the Red Sea; on the S. by Arabia Felix, and on the E. by Chaldæa, or the country of Baſſora. One part of it, called *Auſitis*, is ſuppoſed to have been the land of *Uz*, where Job is ſaid to have reſided.

3. *Arabia Felix*, or the Happy, ſo called for its fertile ſoil and rich perfumes, is now called Ayman, and forms the ſouthern part of Arabia. Among its numerous inhabitants were the *Scenitæ Nomades* or *Kedareni*, part of whom reſided in the S. of Arabia Petræa; the *Nabatæi Nomades*, in the northern parts; the *Sarraceni* in the ſouth of Arabia Petræa, from whence they ſpread themſelves into the neighbouring provinces; [in their country was *Nyſa*, where Oſiris or Bacchus was educated;] the *Sabæi*, part of the Xerifdom of Mecca, and kingdom of Aden; and *Panchæa* or *Panchaia*, which was part of the modern Great Jamen, and the moſt famous province in Arabia for the production of frankincenſe.

V. Of

V. Of the PERSIAN or PARTHIAN Empire.

This extenſive empire, which at firſt belonged to ſeveral princes, mentioned only in the Bible, came afterwards almoſt all under the dominion of the Perſians. It was bounded on the N. by the river Iaxartes, the Caſpian Sea, and Armenia Major; on the W. by part of the ſame Armenia, and of the river Euphrates and Arabia Petræa; on the S. by the bay of Baſſora and part of the Indian ocean; and on the E. by the river Indus and part of Scythia. It comprehended *Aſſyria*, *Media*, *Perſia*, *Parthia* and *Hyrcania*, *Margiana Bactriana* and *Sogdiana*, and *Aria*.

1. ASSYRIA was divided into *Meſopotamia*, *Babylonia*, *Chaldæa*, and *Aſſyria* proper.

Meſopotamia, ſo called becauſe it lay εν μεσῶ ποταμῶν, between the rivers (Euphrates and Tigris) but firſt called *Aram*, was the modern Diarbec proper. The N. E. part of this country was called *Mygdonia*; and part of it on the W. of the Euphrates was called *Arabia Scenitarum*, and inhabited by Hordes of travelling Arabs.

Babylonia, originally included under the name *Chaldæa*, was that part of Yerach, or Iraca, which was ſurrounded on the S. W. or N. by ſome of the branches of the Euphrates, and on the E. by the Tigris. It's capital (which was likewiſe the capital of all ancient Chaldæa) was the famous *Babylon* or *Babel*, a city on the weſtern branch of the Euphrates, about 40 miles W. from Bagdad, and 50 miles in circumference. The Euphrates, which at firſt ran into the Perſian gulph in one ſtream, without mixing with the Tigris, had it's courſe afterwards altered either by art or nature, and was cut into five branches, which are ſuppoſed to be the rivers of Babylon mentioned in Pſ. cxxxvii. 1.

Chaldæa, or *Terra Chaldæorum*, a great part of modern Yerach, or Iraca, was bounded on the W. by the Euphrates; on the N. by the ſouthern and moſt weſtern branches of that river; on the E. by the Tigris, and on the S. by the Mountains of Arabia. Between theſe mountains and the Euphrates ſtood *Orchöe*, ſuppoſed to be the *Ur* of the *Chaldees*, where Abraham's anceſtors lived. The learned *Huet* alſo fixes the Garden of EDEN between the junction of the Tigris and Euphrates, and their ſubſequent ſeparation before they fall into the Perſian gulph.

Aſſyria proper, Curdiſtan, was bounded on the N. by part of Armenia, and the Mountains Niphates and Taurus; on the W. by the Tigris; on the S. by Suſiana or Chuſiſtan; and on the E. by part of Media, and the branches of M. Taurus, called the Choatres and Zagrus. On the E. ſide of the Tigris, and oppoſite to Mouſul, in the province called *Adiabene*, ſtood the famous *Ninus* or *Nineve*, ſixty miles in circumference; and in the ſame province was the village *Gaugamala*, where was fought, between Alexander and Darius, the celebrated battle much better known by the name of *Arbela*, a conſiderable town in the neighbourhood.

2. MEDIA, the country of the Medes, contained the modern Aderbeitzan, Gilan, Tabeſtran, or Mazanderan, and part of Yerac Agemi; and it was bounded on the E. by Parthia, and Hyrcania; on the S. by Perſis, Suſiana, and part of Aſſyria; on the W. by Armenia Major, and on the N. by the Caſpian Sea. It's prin-

cipal places were *Ecbatana*, now Tauris, the capital of the country; and *Gaza*. In the weſtern part of it lived the *Caduſii*, and *Caſpii*.

3. PERSIA was bounded on the E. by Gedroſia and Drangiana, two provinces of Aria; on the S. by the gulph of Perſia; on the W. by the Tigris; and on the N. by Media. It contained the four following provinces, viz.

Suſiana, the moſt weſtern province, now called the Chuſiſtan, whoſe capital was *Suſa*, now Suſter.

Elymais, a ſmall province along the coaſt of the Perſian gulph, now part of the Chuſiſtan.

Perſia propria, now the Farſiſtan, and part of Yerac, (or Iraca) Agemi. It's capital was *Perſepolis*, the ruins of which are near *Schiras*.

And *Carmania*, now the Kerman, E. of Perſis or Perſia. It's capital was *Carmana*.

4. PARTHIA and HYRCANIA, anciently one kingdom, were the modern Choraſan, the former containing the ſouthern, and the latter the northern part of that country. In Parthia was *Aſpa*, ſuppoſed to be Iſpahan; and the capital of Hyrcania had the ſame name as the province.

5. As to *Margiana*, *Bactriana*, and *Sogdiana*,

MARGIANA was the ſouthern part of Uſbeck Tartary, and among it's inhabitants were the *Derbices* and *Maſſagetæ*.

BACTRIANA was the eaſtern part of Uſbeck Tartary. Among its inhabitants were the *Acinacæ*, and it's capital was called *Bactra*.

And SOGDIANA was the northern part of Uſbeck Tartary. It's capital was *Drepſa*.

Through theſe countries ran the rivers *Oxus* and *Ochus*, now the Gichum and Obengir.

6. Aria comprehended the Regio *Paropamiſadarum*, now the eaſtern part of the Sabluſtan, and the province of Candahar; *Aria* proper, or *Ariana*, almoſt all the Sabluſtan; *Drangiana*, the weſtern part of the Sitziſtan; *Arachoſia*, the eaſtern part of the Sitziſtan; and *Gedroſia*, the Makeran.

The moſt noted river in this country was the *Indus* or *Choaſpes*, now the Caron.

The Southern Part of Asia or E. India.

India, though one of the largeſt parts of Aſia, was not by far ſo well known to the ancients as to the moderns. It was, however, divided into *India intra Gangem*, *India extra Gangem*, *Sinarum Regio*, and *Inſulæ Maris Indici.* It was called *India*, becauſe it lay beyond the river *Indus.*

I. India intra Gangem.

India within or on this ſide of the Ganges, was bounded on the E. by the Ganges; on the S. by the Bay of Bengal, and part of the Indian Ocean; on the W. by Gedroſia, Arachoſia, and Parapamiſſus; and on the N. by Mount Imaus; ſo that it comprehended nearly all the Great Mogul's dominions. In this part of India were the *Brachmanes* and *Gymnoſophiſtæ*, who were not only a ſect of philoſophers, but a political community; and alſo the dominions of King *Porus*, the nobleſt captive of Alexander the Great, between the rivers *Hydaſpes* and *Aceſines*, which ran into the *Indus.* The largeſt river in India is the *Ganges.*

II. India extra Gangem,

Was bounded on the E. by the country of the *Sinæ*; on the S. by the Indian ocean; on the W. by the Ganges; and on the N. by Scythia. In this country was the *Cherſoneſus aurea*, or *Sophira*, now the Peninſula of Malacca, the kingdom of Siam, and iſland of Sumatra, and ſuppoſed to be the wealthy *Ophir* of Solomon.

III. *Sinarum Regio*, or the weſtern part of China, was little known to the ancients; and all beyond it towards the eaſt was included under the general name of *Terra Orientalis Incognita*.

IV. The moſt noted Iſlands in the Indian Sea were *Taprobane*, probably the Iſland of Ceylon; and *Solis Inſulæ*, including the *Maniolæ Inſulæ*, and the *Sindæ*, generally ſuppoſed to be the Maldives, and the Celebes.

CHAP. IV.

OF AFRICA.

THE ancients knew ſcarcely any other but the northern parts of Africa, and a little of Ethiopia, imagining the reſt to be uninhabitable, as lying in the Torrid Zone. They divided it into *Ægyptus*, *Libya*, *Africa propria*, *Mauritania*, *Africa interior*, *Ethiopia*, and the Iſlands.

I. ÆGYP-

I. ÆGYPTUS.

ÆGYPT, frequently called in the Bible *Mizraim*, was ſo populous and well cultivated, that it contained no leſs than 18,000 towns, the true ſituation of moſt of which is now unknown, on account of the many changes and revolutions the country has ſuffered. It was moſt commonly divided into *Ægyptus inferior* and *Ægyptus ſuperior*.

ÆGYPTUS INFERIOR, or Lower Ægypt, the beſt-peopled part, extended from the beginning of the branches of the Nile to the Mediterranean Sea. It contained,

1. *Mareotis*, which lay ſouth of Alexandria, and abounded in excellent wines. In this *nomos*, or government, was the Lake *Marea*.

2. *Alexandrina Regio*, the territory of Alexandria, between the Lake Marea, and the weſtern mouth of the Nile. In it ſtood *Alexandria*, built by Alexander the Great, called *No* by the Jews, and Scanderik by the moderns. In the iſland of *Pharos*, which had a communication with *Alexandria*, either by a bridge or mole, was a magnificent tower and light-houſe, which was eſteemed one of the ſeven wonders of the world. The city itſelf was ſometimes called *Pharos*.

3. *Delta*, ſo called by Herodotus, and others, becauſe in ſhape it reſembled the Greek letter Δ, was incloſed by the eaſtern and weſtern branches of the Nile, and part of the Mediterranean. All the ancients agree, that the Nile diſcharged itſelf into the Mediterranean by ſeven large ſtreams or channels; beſides

which there were five others leſs conſiderable. The greater part of the mouths of the Nile have been ſince ſtopped up, and others formed: ſo that at preſent, when the river overflows, it is carried into the ſea by more than thirty channels, which are moſt of them left dry when the waters retire. Beſides the above channels, there were ſeveral others cut for the convenience of navigation and commerce, particularly the *Foſſa Trajani*, from Babylon to the neareſt point of the Red Sea, and the *Foſſa Regum* from the eaſtern channel to the ſame point. The two chief and only conſiderable channels, at preſent, are *Roſetta* or *Raſhid*, on the weſt, and *Damietta* on the eaſt.

In the government of Delta were the cities *Buſiris*; *Tanis*, or *Zoan*; and *Babylon*, ſuppoſed to be Grand Cairo; and towards the mouth of the Damietta was *Peluſium*, a large government or diſtrict.

4. *Ægypti Latus Arabicum* lay E. of the Nile, and joined to Arabia Petræa. It contained, among ſeveral other governments, the Land of *Goſhen*, the reſidence of the Iſraelites during their bondage.

ÆGYPTUS SUPERIOR lay on the ſouth of *Ægyptus inferior*, and extended as far as Ethiopia, or a little beyond the tropic of Capricorn. It was divided into *Heptanomis* and *Thebäis*.

1. *Heptanomis*, ſo called becauſe it contained ſeven *nomoi*, or governments, lay between Lower Egypt and *Thebais*. One of it's governments was *Memphiticus Nomos*, the capital of which, and of all Egypt, was *Memphis*, at a ſmall diſtance from Cairo, on the oppoſite ſide of the Nile, but now in ruins; and not far from

Memphis were thoſe wonders of the world, the celebrated *Pyramids*, which were the burying places of the kings of Egypt. Another of it's governments was *Arſinoites*, S. of *Memphiticus*, and on the W. ſide of the Nile; in the weſtern part of which government was the Lake *Mæris*, full of crocodiles, and dug by the order of King Mæris, as a receptacle for the waters of the Nile, when they roſe too high, or above ſixteen cubits. Near this lake alſo was a famous labyrinth, conſiſting of twelve palaces, which contained in all 3000 apartments, ſo diſpoſed that a perſon might eaſily loſe himſelf among them; and at a conſiderable diſtance from the lake, S. W. was *Oaſis Magna*, ſurrounded by ſandy deſarts, which, when ſtirred by whirlwinds, frequently buried travellers underneath them.

2. *Thebäis*, now called Sayd, was the moſt ſouthern part of Egypt, and lay between Hepatomis and Ethiopia. In this country was *Tentyra*, whoſe inhabitants, inſtead of paying the ſame veneration to crocodiles as the reſt of the Egyptians, took a great deal of pains to deſtroy them. Here alſo was *Elephantina*, in an iſland of the Nile bearing the ſame name, which was the fartheſt or laſt town belonging to Egypt on the S. W. as *Metacompſo* was on the S. E. and above this iſland was the laſt and ſmalleſt cataract of the Nile, where the river ceaſed to be navigable. The people near the cataracts were called *Catadupi* or *Catadupæ*.

On the eaſtern ſide of the iſle, in the government of *Thebes* was *Thebæ*, or *Dioſpolis Magna*, which had 100 gates, or, according to ſome, 100 princely palaces, and whoſe ruins are ſtriking monuments of it's ancient magnificence.

The part of Abyſſinia along the coaſt of the Red Sea, was called *Troglodytice*, and ſubject to Egypt.

In the ſacred writings *Tanis* was called Zoan; *Magdolum*, near the Red Sea, Migdol; *Peluſium*, Sin: *Memphis*, Noph, or Moph; *Thebæ* or *Dioſpolis*, No; and, according to ſome, *Alexandria*, No.

II. LIBYA.

Libya, containing the preſent kingdom and Deſart of Barca, comprehended *Marmarica*, and *Cyrenaica*, along the coaſt of the Mediterranean, on the weſt of Egypt; and *Libya* proper lying S. of the two former diviſions.

1. *Marmarica* lay next to Egypt. In this country was *Ammoniaca Regio*, famous for the temple of *Jupiter Ammon*, which ſtood in a place ſurrounded with ſandy deſarts, and was therefore very difficult of acceſs. In a grove near the temple was *Fons Solis*, the celebrated fountain of the ſun. In this country alſo were the *Catabathmus Magnus* and *Parvus*, two ranges of mountains frequently noticed by hiſtorians.

2. *Cyrenaica*, or *Pentapolis*, lay along the Mediterranean weſt of Marmarica. In this country were *Berenice*, formerly *Heſperides*, now Bernicho (near which were the famous *Horti Heſperidum* or Gardens of the Heſperides;) and the *Pſylli*, who were famous for their ſkill in curing the bite of ſerpents, reſided S. W. of Cyrenaica.

3. *Libya arida* or *deſerta*, lying S. of the two former provinces; but different from *Libya interior* of which hereafter.

III. AFRICA PROPRIA.

AFRICA PROPRIA, or *Syrtica Regio* (ſo called becauſe it lay between the two *Syrtes*, or ſand ſhelves, on its coaſts, viz. *Syrtis Magna* on the eaſt, and *Syrtis Minor* on the weſt) contained the kingdoms of Tripoli, Tunis, and part of Algier and Biledulgerid. It was divided into two provinces, viz.

1. *Syrtica Regio*, or *Tripolitana*, between the two Syrtes, and containing almoſt all the modern Tripoli. It was called *Tripolitana*, from the three noted cities *Sabrata*, *OEa*, and *Leptis Magna*.

2. *Africa propria*, now the kingdom of Tunis, and a fruitful country, was divided into *Byzacium*, and *Zeuges*. *Byzacium* lay eaſt of *Zeuges*.

In the latter were *Aſpis* or *Clypea*; *Tunes*, Tunis; *Utica*, Biſerta, weſt of Carthage; and *Carthago*, in Greek *Carchedon*, and in the Punic language *Carthada* (*qu. Cartha hadtha*, the new town) a famous city which was a long and dangerous rival to Rome, but at laſt was forced to ſubmit to her ſuperior good fortune. In the ſpot which formed the center of the laſt mentioned city there is ſtill to be ſeen a caſtle, or citadel, which retains its ancient name *Byrſa*; as alſo ſeveral curious remains of antiquity.

IV. NUMIDIA.

NUMIDIA, now the kingdom of Algier, was divided into *Numidia propria*, and *Numidia Maſſæſylorum*.

1. *Numidia propria* lay between the rivers *Tuſca* and *Ampſaga*, the modern Guadilbarbar, and Suf-gemar, and is now called the province of Conſtantina. Its capital was *Cirta*, the royal ſeat of the great Maſiniſſa and his ſucceſſors; it is ſuppoſed to be the preſent Conſtantina.

2. *Numidia Maſſæſylorum* lay on the weſt ſide of the former, and was parted from it by the river Suf-gemar.

South of Algiers and Tunis lay the *Garamantes*, about Tenes and Bogia.

V. MAURITANIA.

MAURITANIA, one of the largeſt provinces of Africa, extended weſtward from Numidia to the Atlantic Ocean, and ſouthward as far as Mount Atlas; ſo that it contained part of the K. of Algier and Biledulgerid, and the kingdoms of Fez, and Morocco. It was divided into two parts, viz.

1. *Mauritania Cæſarienſis*, adjoining to Numidia on the W. And,

2. *Mauritania Tingitana*, lying W. of the former, and comprehending the kingdoms of Fez, Morocco, and Tafilet. Its inhabitants were called *Mauri*, the Moors; and in this country were the famous mountains *Atlas major*, and *minor*.

VI. AFRICA, OR LIBYA INTERIOR OR ULTERIOR.

This part of Africa was the modern Zaara and Nigritia, and but little known to the ancients. They divided it into four parts, viz.

1. The *Gætuli*, a wandering people who oc-

cupied the country between Mauritania and the Niger. They aſſiſted the Romans in their wars againſt the *Mauri*.

2. The *Nigritæ*, who inhabited the modern Agades. The preſent Negroland, of which it was a part, derives its name and people from the ancient *Nigritæ*.

3. The *Garamantes*, who poſſeſſed the modern Borno. The ancients called them *Extremi Garamantes*, becauſe they believed their country to be the end of the world. And,

4. The *Æthiopes Heſperii*, now part of weſtern Æthiopia.

The *Niger* was, and ſtill is, the moſt conſiderable river in Africa, next to the Nile, and liable to the ſame annual inundations.

The heights of Sierra Lione were called *Currus Deorum*.

VII. ÆTHIOPIA.

ÆTHIOPIA lay S. of Egypt, and was divided into *Æthiopia ſupra Ægyptum*, and *Æthiopia interior*.

1. *Æthiopia ſupra Ægyptum*, called *Chus* in the ſacred writings, lay part on the E. and part on the W. ſide of the Nile. In the former were the *Blemmyes*, on the confines of Egypt; and alſo the great cataract of the Nile, which was near 200 feet high.

2. *Æthiopia interior* contained Nubia, Monoemugi, and Ethiopia. Ptolemy ſuppoſed the ſources of the Nile were in the Lunar Mountains in Monoemugi; but they have ſince been diſcovered to riſe from ſome large mountains in the K. of Goyam in Abyſſinia.

VIII. The

VIII. The ISLANDS.

The moſt noted African Iſlands were, *Meninx*, or *Lotophagites Inſula*, on the coaſts of Tunis and Algiers.

Fortunatæ Inſulæ, the Canaries in the Atlantic. And,

The famous iſland of *Cerne*, ſuppoſed by ſome to be Madagaſcar, but more probably one of the Cape de Verd Iſlands.

AMERICA

Was entirely unknown to the ancients.

APPENDIX on *Sacred Geography*.

WE have before obſerved that the country of Paleſtine, originally called the land of Canaan, was firſt divided into ſmall kingdoms; then by the Jews into 12 tribes; next into the kingdoms of Judah and Iſrael; and laſtly into ſeveral provinces or royalties.

I. Of ancient CANAAN.

The ancient inhabitants of Canaan derived their original from Chanaan, the Grandſon of Noah. They were,

1. The Sidonians, whoſe principal towns were Sidon and Tyre.

2. The Hittites, round Kirjath-arba, afterwards called Hebron, in the tribe of Judah.

3. The Perizzites, about Bethel, and Ai, in the tribe of Benjamin.

4. The Amorites, a wandering people, who at laſt ſettled among the Moabites and Ammonites.

5. The Canaanites, the peculiar deſcendants of Chanaan, and the moſt conſiderable people in the country. They dwelt upon the banks of Jordan towards the ſea of Tiberias.

6. The Hivites, between mount Hermon and Lebanon, in the N. part of Manaſſeh.

7. The Girgaſhites, ſuppoſed to have reſided in the half-tribe of Manaſſeh beyond Jordan. And

8. The Jebuſites, the moſt martial people in the country, who dwelt about Jeruſalem; but were afterwards forced to retire among the Philiſtines.

II. The Diviſion of CANAAN into TRIBES.

After Canaan was conquered by the Jews, it was divided into 12 tribes as follows:

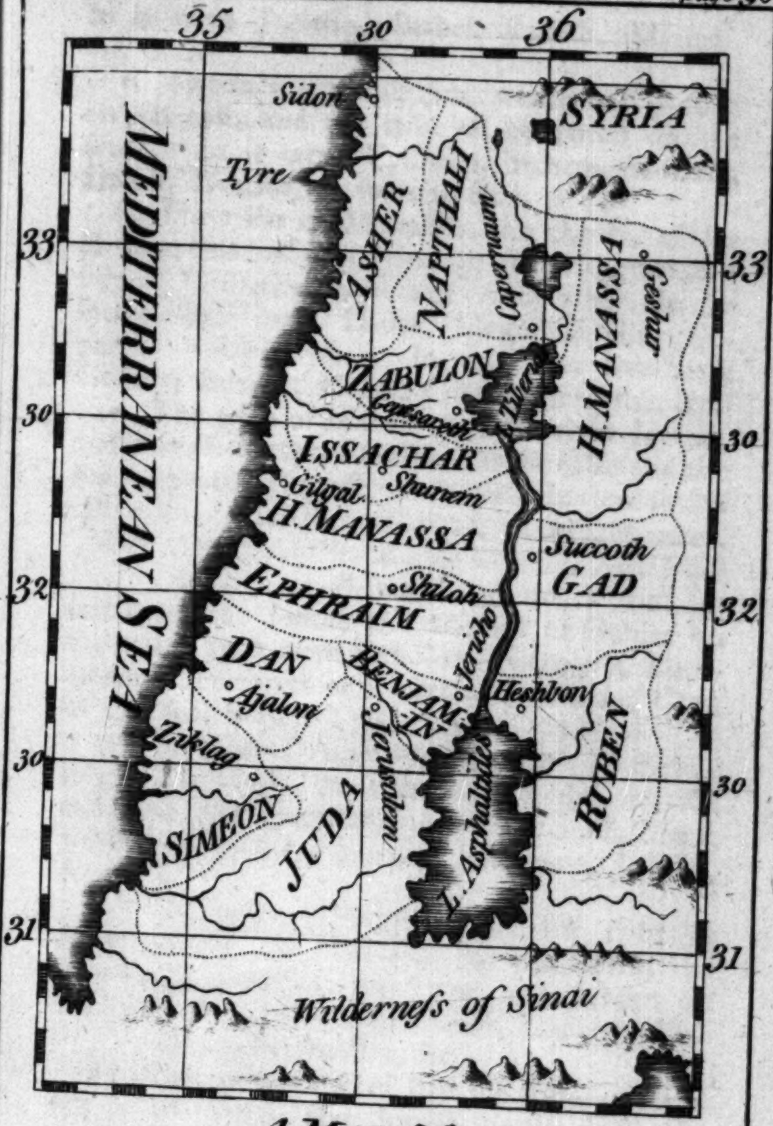
1. The tribe of Judah, the largeſt and moſt populous among them, in the ſouthern part of the country, between the Mediterranean and the Dead, or Salt Sea. In it were Jebus or Jeruſalem, Bethlehem, Hebron, Kedeſh, Zoar, Beerſheba, Ziklag, Adullam, Lachiſh, Ekron, Aſhdod, Gibeah, &c.

2. The tribe of Simeon, almoſt ſurrounded by that of Judah, except on the North. In it were Bethul, Hormah, Ziklag, &c.

3. The tribe of Dan, on the north of the tribe of Simeon. In it were Ajalon, Eſhtaol, Joppa, Laiſh, &c.

4. The tribe of Benjamin, which had the river Jordan on the eaſt, and Judah on the South. In

PLATE II. page 98.



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In it were Jericho, Bethel, Ramah, Mizpeh, Ai, &c.

5. The tribe of Ephraim, which had Jordan on the eaſt, and the tribe of Benjamin on the ſouth. In it were Ephraim, Sichem, Samaria, Shiloh, Iſcariot, Bethaven, &c.

6. The tribe of Manaſſeh, on the N. of Ephraim, one half of it lying on *this* or the weſtern ſide of Jordan, and one half on the other. In the former half were, Endor, Megiddo, Salim, Ephrah, Gilgal, &c. In the latter half were Geſhur, Bozrah, Kedar, Gilead, Gergeſha, &c.

7. The tribe of Iſſachar had the river Jordan, and part of the ſea of Galilee on the eaſt, and the half-tribe of Manaſſeh on this ſide Jordan on the ſouth. In it were Iſſachar, Kadeſh, Shunem, Tabor, Bethſhemeſh, mount Carmel, &c.

8. The tribe of Zebulon had the tribe of Iſſachar on the ſouth, and the ſea of Galilee on the eaſt. In it were Zebulun, Nazareth, Bethlehem, Geneſareth or Tiberias, Bethſaida, Cana of Galilee, mount Tabor, &c.

9. The tribe of Aſher had the tribe of Zebulon on the ſouth, the tribe of Naphtali on the eaſt, and the Mediterranean on the weſt. In it were Tyrus, Sidon, Sarepta, Ptolemais, Achzib, &c.

10. The tribe of Naphtali had the tribe of Aſher on the weſt, Lebanon on the north, the tribe of Zebulon on the ſouth, and Jordan on the eaſt. In it were Capernaum, Cæſarea Philippi, Hazor, Naphtalim, &c.

11. The tribe of Gad had the tribe of Reuben on the ſouth, and Jordan on the weſt. In it were Heſhbon, Succoth, Saron, Bethabara, &c. And,

12. The tribe of Reuben had the tribe of Gad on the north, and Jordan and part of the Dead Sea on the weſt. In it were Heſhbon, Kedemoth, Bethpeor, Nebo, mount Piſgah, &c.

Six cities were appointed for cities of refuge, viz. Kedeſh in the tribe of Naphtali, Shechem in Ephraim, Hebron or Kirjatharba in Judah, Bezer in Reuben, Ramoth-gilead in Gad, and Golan in the eaſtern half-tribe of Manaſſeh.

It muſt likewiſe be obſerved that 48 cities were allotted for the maintenance and habitation of the Levites.

III. Diviſion of PALESTINE into KINGDOMS.

During the reign of Rehoboam, the ſon and ſucceſſor of Solomon, Paleſtine was divided into the kingdoms of Judah and Iſrael. The kingdom of Judah contained the tribes of Judah and Benjamin, and the kingdom of Iſrael the ten remaining tribes.

IV. Diviſion of PALESTINE into TETRARCHIES.

The moſt common diviſion of Paleſtine about the time of our Saviour was into Galilee, Samaria, Judæa, the country of the Philiſtines, Trachonitis, Ituræa, and Peræa.

Galilee contained the tribes of Iſſachar, Zebulon, Aſher, and Naphtali, or the northern part of Paleſtine, between Jordan and the Mediterranean.

Samaria contained the tribe of Ephraim, and the half-tribe of Manaſſeh on this ſide Jordan.

Judæa (though ſometimes uſed to denote the whole country) contained only the tribes of Judah,

dah, Benjamin, Dan, and Simeon. Its capital was Jeruſalem, which was built on four hills, viz. mount Sion or the city of David; mount Acra, on which ſtood the ancient Salem; mount Moriah, on which ſtood the temple; and mount Bezetha, from which ſprang the brook Cedron. North-eaſt of Jeruſalem, and beyond this brook, was the mount of Olives, on which ſtood the village of Bethphage, and a little farther that of Bethany.

The Philiſtines poſſeſſed the country between the tribes of Simeon, and Dan, and the Mediterranean. Their towns were Aſhdod or Azotus, Gaza, Aſcalon, Gath and Ekron. They were a martial people, and a continual plague to the Iſraelites. Their rivers were Sorek, and Beſor *(or the river of Egypt)* which ran into the Mediterranean, and according to ſome the river Eſhcol or Botri.

Trachonitis, ſo called becauſe it was a mountainous and barren country, lay in the half-tribe of Manaſſeh beyond Jordan.

Ituræa comprehended the largeſt part of the tribe of Gad. And

Peræa comprehended the tribe of Reuben, and the remainder of Gad on the ſouth.

PART THE THIRD:

CONTAINING THE

DESCRIPTION AND USE OF THE GLOBES,

THE

PRINCIPLES OF DIALLING,

AND THE

USE AND CONSTRUCTION OF MAPS.

CHAP. I.

Deſcription of the Globes.

A *GLOBE* or *ſphere* is a round body, every part of whoſe ſurface is equally diſtant from it's center.

That the earth is very nearly ſpherical, is evident from its always caſting a round ſhadow upon the moon when ſhe is eclipſed: for, as an eclipſe of the moon proceeds from the interpoſition of the earth between her and the ſun, which intercepts the rays of the latter, it is plain that the ſhadow which is viſible upon the moon, in a partial eclipſe, muſt correſpond with the figure of the earth; if therefore that ſhadow is always obſerved to be of a circular form, the figure of the earth muſt be very nearly *ſpherical.* It may alſo be remarked that ſeveral perſons have actually ſailed round the earth ; and that our ſeeing the farther the higher we ſtand, and diſcerning the maſts of a ſhip at ſea, while the hull is entirely hid, are inconteſtable proofs of the convexity of the earth's ſurface.

The ſpherical figure of the earth is owing to the attraction of gravitation, a property in the larger compoſitions or ſyſtems of matter, by which every part of them naturally gravitates or tends towards their center. We therefore find that all the other planets are of a globular form ; which is a ſtrong preſumptive proof that the earth is ſo likewiſe.

But though the earth be *ſpherical* it is not a *perfect ſphere*, but an *oblate* ſpheroid flatted towards the poles like a turnep ; i. e. the axis of the earth is not ſo long as the diameter of the equator, by 35 miles, the proportion between them being that of 229 to 230. This is owing to the ſwift rotation of the earth round its axis ; for as every body or particle of matter in motion, which deſcribes a circle round a center, makes a continual effort to recede from that center (as is evident from the ſtraining of a ſling with a ſtone in it, while you whirl it round ;)—and as this effort, where the revolution is performed in equal times, will be in proportion to the greatneſs of the circle deſcribed by the particle in motion ; it will follow, that as the particles under the equator deſcribe a much larger circle, during the diurnal rotation of the earth, than thoſe which lie near the poles, their efforts to recede from the center muſt be much more violent.

From what hath been ſaid concerning the figure of the earth, it will be eaſy to conceive that if a map of the world is accurately delineated on a round body or globe, the ſurface of that globe will then repreſent the ſurface of the earth : for as the higheſt hills are not more than four miles, or the 2000th part of the diameter of the earth, above the ſurface of the ſea, the inequalities occaſioned by mountains and vallies will bear no greater proportion to the bulk of the earth, than the little aſperities upon the rind of an orange to it's bulk, or than ſo many grains of ſand to the bulk of a common globe.

Though the ſtars and planets are at different diſtances from us, and of different *real*, as well as *apparent* magnitudes, yet, as being very remote objects, they appear to the eye to be equally diſtant from the earth, and to be placed like ſo many bright ſtuds in a large azure ſphere, of which the earth is the center. If, therefore, upon an artificial globe, or hollow ſphere, the ſurface of which we *may* imagine to be tranſparent, we delineate as many ſpecks or characters as there are ſtars viſible in the heavens, and make thoſe characters of the ſame reſpective magnitudes, and at the ſame angular diſtances from each other as the ſtars ; a ſphere ſo conſtructed will be a true repreſentation of the ſtarry heavens to the eye of an obſerver, ſuppoſed to be placed in the center or middle of its axis.

As for the more ready diſtinction of places upon the terreſtrial globe, geographers have divided the ſurface of it into four quarters, and thoſe quarters into different countries and kingdoms ; ſo aſtronomers, that they may more eaſily diſtinguiſh the ſtars, have divided them into different *aſteriſms*,

riſms, or *conſtellations*; which they have reduced to the imaginary forms of particular beaſts, birds, or other things, as may be ſeen upon the celeſtial globe.

The circles which are either deſcribed upon, or fixed round the globes, both terreſtrial and celeſtial, may be divided into the *greater* and *leſſer* circles.

The *greater* circles are thoſe which divide the globe into two equal parts, or hemiſpheres.

The *leſſer* circles are thoſe which divide the globe into two unequal parts.

The periphery or circumference of every circle is ſuppoſed to be divided into 360 equal parts, which are called *degrees*; and each degree in a *greater circle* contains 60 geographical miles, and ſomething more than 69 Britiſh miles; ſo that the circumference of the earth computed in the latter is nearly 24,840 miles, and its diameter 7910 miles.

I. of the GREATER CIRCLES.

The greater circles are the *Equinoctial*, the *Ecliptic*, the *Meridian*, the *Horizon*, and the *Colures*.

The *Equator* is a great circle upon the terreſtrial globe, which is every where equally diſtant from the poles, or two extremities of its axis, and divides the globe into the northern and ſouthern hemiſpheres. If we imagine the plane of this circle to be every way equally extended till it reaches the ſtarry heaven, it will there mark out a circle which is called the *Equinoctial*, or *celeſtial Equator*, which is every where equally diſtant from the *poles of the heavens*, or from thoſe two points in the ſtarry firmament, where the axis of the earth would terminate, if it were produced from each of its extremities. The equator and equinoctial are deſcribed on artificial globes (the former upon the terreſtrial, and the latter upon the celeſtial) by two ſtrong parallel lines with a fine hair one between them.

As the earth turns round on its axis once in 24 hours (which occaſions the alternate ſucceſſion of day and night) ſo it likewiſe goes round the ſun once a year. The circle it deſcribes in its annual revolution is called its *Orbit*; and that circle which the plane of its orbit would mark out, if it were extended to the ſtarry heavens, is called the *Ecliptic.* The Ecliptic, therefore, is that circle which the ſun *ſeems* to deſcribe in his annual or yearly courſe: for though it is really the earth which moves every year round the ſun, in her proper orbit, yet the ſun appears to move round the earth every day, changing his place in the ecliptic almoſt a degree in that time: ſo that, as the ecliptic, like all other great circles, contains 360 degrees, the ſun will ſeem to move round the ecliptic once a year. It is likewiſe plain from hence that whatever degree of the ecliptic the earth is in at any given time, the ſun muſt then appear to be in the oppoſite degree, though he is really at all times in the center of our ſyſtem. The plane of the ecliptic makes an angle of 23½ degrees with the plane of the equator, or equinoctial; and the two circles interſect each other in two oppoſite points. As, therefore, one half of the *Ecliptic* is on the north ſide of the *Equinoctial*, and the other half on the ſouth; the ſun, as ſeen from the earth, will be half a year on the ſouth ſide of the equinoctial, and half a year on the north, and twice a year in thoſe two points of the *Equinoctial* where it is interſected by the *Ecliptic.* Thoſe two points are called the *Equinoctial Points*, and the time when the ſun enters either of them is called the *Equinox.* When the ſun is in the *Equinoctial Points*, he will be perpendicular to the center of the earth's axis, or directly over the equator, and give an equal ſhare of day-light both to the northern and ſouthern hemiſpheres; and, conſequently, the days and nights will then be equal (conſiſting each of 12 hours) in every part of the world. This is the reaſon why the *Equinoctial*, and the *Equinoxes* are ſo called. As the ſun enters one of the equinoctial points in the ſpring, and the other in autumn, the former is called the *Vernal*, and the latter the *Autumnal Equinox.* The *vernal* equinox falls on the 20th of March, and the *autumnal* on the 23d of September.

When the ſun leaves the *vernal* equinox, he moves farther from the equinoctial every day towards the north, till he hath paſſed through 90 degrees of the ecliptic, when he again approaches the equinoctial in the ſame manner; and as ſoon as he leaves the *autumnal* equinox, he gradually recedes from the equinoctial towards the ſouth, through as many degrees of the ecliptic as he did before towards the north; ſo that his greateſt diſtance from the equinoctial, either towards the north or ſouth, will be at the 90th degree of the ecliptic from either of the equinoxes. Thoſe two oppoſite points, or degrees of the ecliptic, are called the *ſolſtitial points.* The time when the ſun enters the northern ſolſtitial point is called the *æſtival* or *ſummer Solſtice*, becauſe it is then the middle of our ſummer ; and the time when he enters the ſouthern is called the *hyemal* or *winter Solſtice*, becauſe it is then the middle of our winter. But in the ſouthern hemiſphere the ſolſtices will be inverted ; becauſe it is our winter when it is their ſummer, and *vice verſa*. They are called *Solſtices*,* becauſe, at thoſe times, the ſun appears to ſuch who are at any conſiderable diſtance from the equator (as we are) to ſtand ſtill ; that is, not to change his place in the ecliptic for ſeveral days.

The *direct* diſtance of the ſun from the equinoctial, in his courſe through the ecliptic, is called his *declination* ; which is ſaid to be either *north*, or *ſouth declination*, according as he is on the north or ſouth ſide of the equinoctial. The ſame term is likewiſe applied to any of the ſtars, or planets, and with the ſame meaning.

Beſides the diviſion of the ecliptic into 360 degrees (which is common to all the other great circles) it is likewiſe divided into 12 ſigns, each containing 30 degrees. Their names, and characters are theſe, viz.

Aries, Taurus, Gemini, Cancer, Leo, Virgo,
♈ ♉ ♊ ♋ ♌ ♍
Libra, Scorpio, Sagittarius, Capricornus,
♎ ♏ ♐ ♑
Aquarius, Piſces.
♒ ♓

The firſt ſix of theſe ſigns are called the northern, and the remaining ſix the ſouthern ſigns, on account of their poſition with reſpect to the equinoctial. They are counted from W. to E. beginning with *Aries*, which is in the vernal equinoctial point: ſo that *Cancer* will be in the ſummer ſolſtitial point, *Libra* in the point of the *autumnal Equinox*, and *Capricorn* in that of the winter-ſolſtice. It muſt, however, be noticed, that the *ſigns* are different from the *conſtellations* which bear the ſame names. In the infancy of aſtronomy, when thoſe names were firſt introduced, it is highly probable that the conſtellations were ſituated in their ſynonymous ſigns. But as it hath been diſcovered that the equinoctial points, and with them the whole ecliptic and its ſigns, change their poſition, by a retrograde motion towards the weſt, 50 ſeconds in a year, while the conſtellations, from which the ſigns were firſt denominated, preſerve their original places in the heavens; it is evident that the conſtellations muſt have their ſituation in the ecliptic continually ſhifting towards the eaſt: ſo that now the conſtellation *Aries* has got into the ſign *Taurus*, and that of *Piſces* into the ſign *Aries*, and ſo on of the reſt. This retrograde motion of the equinoctial points, as being in *Antecedentia*, or towards the ſigns which immediately preceed them, (reckoning from W. to E.) is called the *preceſſion of the equinoxes*.

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* The word *Solſtice* is derived from the Latin words *Sol*, the ſun, and *ſto*, to ſtand or continue in the ſame place.

As to the *names* and characters of the 12 ſigns, they were probably introduced by the ancient Egyptians, who were remarkable for their ſkill in aſtronomy, and for the uſe of hieroglyphical or ſymbolical characters. The months of March, April, and May being the ſpring quarter of the year, when lambs, calves, and kids (which are uſually twins) are brought forth; their correponding ſponding ſigns were therefore called *Aries*, *Taurus*, and *Gemini*, *i. e.* the ram, the bull, and the twins. *Cancer*, the crab, as moving ſideways or obliquely, repreſents the oblique motion of the ſun in June, when he recedes from the ſummer ſolſtice. *Leo*, the lion, denotes the raging heat of the ſun in July. *Virgo*, the gleaning virgin, with an ear of corn in her hand, is a proper emblem of Auguſt, the uſual time of harveſt. *Libra*, the balance, is diſplayed in September, to ſignify that in that month the ſun enters the autumnal equinox, and diſpenſes an equal portion of day and night to every part of the globe. *Scorpio*, the ſcorpion, was adopted as the emblem of October, on account of the venomous diſeaſes which then afflict the earth. *Sagittarius*, the archer, diſtinguiſhes November as the proper ſeaſon for hunting. *Capricornus*, the goat, for its activity in climbing the ſteepeſt mountains, became the hieroglyphic of December, when the ſun, after having paſſed the winter ſolſtice, aſcends again towards the equinoctial. *Aquarius*, the water-bearer, with his heavy urn, repreſented January, on account of the rains which were then moſt frequent: and laſtly *Piſces*, the fiſhes, were very pertinent emblems of the fiſhing ſeaſon, which began in the Nile during the month of February, when the river, after overflowing the country, had returned to its natural channel.

To aſſiſt the reader in committing the names of the twelve ſigns to memory, we ſhall preſent him with the following Latin diſtich: viz.

Signa, Aries, Taurus, Gemini, Cancer, Leo, Virgo,
Libraque, Scorpius, Arcitenens, Caper, Amphora, Piſces.

To theſe we beg leave to ſubjoin the following memorial lines in Engliſh, for the benefit of thoſe who are unacquainted with Latin.

"The Ram, the Bull, the heav'nly Twins,
"And next the Crab the Lion ſhines,
"The Virgin, and the Scales;
"The Scorpion, Archer, and Sea-goat,
"The Man that holds the Watering-pot,
"And Fiſh with glitt'ring tails."
Watts.

To gratify the curioſity of our readers, as far as our plan will permit, it may not be amiſs to obſerve that, according to the opinion of many aſtronomers, the obliquity of the ecliptic to the equator has been always gradually decreaſing, and their reſpective planes continually approaching to a coincidence. This opinion is not only ſupported by a compariſon of ancient and modern obſervations, but by the conſideration of the figure of the earth: for as the earth, as before obſerved, is flatted towards the poles like a turnep, the ſun, being always in the plane of the ecliptic, may eaſily be conceived to exert its attractive power upon the protuberant parts of the equator, ſo as to be continually drawing the plane of it to a coincidence with that of the ecliptic, and thus diminiſhing the angle between them. I have mentioned this circumſtance, becauſe it may aſſiſt my claſſical readers to account for the extravagant pretenſion of the Chaldeans (as recorded by Diodorus Siculus) that they had aſtronomical obſervations of 403,000 years before Alexander the Great: for ſuppoſing them to have diſcovered that the obliquity of the ecliptic decreaſed a minute every 100 years, if we run back 402,943 Chaldean years from Alexander's entrance into Babylon, we ſhall then come to the period when the ecliptic and equator interſected each other at right angles, and from whence it is probable they dated the exiſtence of their nation, which falls but 58 years ſhort of the pretended date of their firſt aſtronomical obſervations.

We have already obſerved that the plane of the *Ecliptic* makes an angle of 23½ degrees with that of the equator, or equinoctial: as their axes, therefore, interſect each other in their reſpective centres, they muſt form the ſame angle; ſo that the poles of the ecliptic will be 23½ degrees from the poles of the earth. (*Vide* the globes.)

The ſun is eight days longer in the northern half of the ecliptic than in the ſouthern; and conſequently the ſummer half year is eight days longer than the winter half. To conceive the reaſon of this, it will be ſufficient to remark that the orbit of the earth is elliptical; that the ſun is placed in one of the *focuſes* of the ellipſis; and that the earth is neareſt to that focus, and conſequently to the ſun, at the latter end of December, (or in the eighth degree of Capricorn) and fartheſt from it at the latter end of June (or in the eighth degree of Cancer) as is evident from the diameter of the ſun appearing to be larger at the former of thoſe times, and ſmalleſt at the latter. It having, therefore, been diſcovered that the velocity of any planet which moves round the ſun, will always increaſe in proportion as their diſtance decreaſes, and *vice verſa*; it will follow that the motion of the earth, in its annual orbit, will be ſwifter in the winter than in ſummer, and conſequently, that the ſun will appear longer in the northern half of the eliptic, than in the ſouthern *.

The *Ecliptic* is ſo called, becauſe an eclipſe never happens but when the moon is in the ecliptic; for as the ſun can never be eclipſed, unleſs when the moon is exactly between the ſun and the earth, and conſequently in the ſame part of the ecliptic as the former is; ſo the moon can never be eclipſed, unleſs when the earth is between her and the ſun, or when ſhe is in the oppoſite part of the ecliptic to that in which the ſun is.

As the orbits or ecliptics of none of the planets make an angle of above eight degrees with that of the earth, this has given riſe to an imaginary *faſcia*, or *belt*, round the celeſtial globe, which is formed by deſcribing on each ſide of the ecliptic a parallel circle at the diſtance of eight degrees; ſo that the entire belt will be 16 degrees broad. It is called the *Zodiac*, or circle of animals, becauſe it is divided into twelve equal parts by twelve ſigns, which bear the names of the animals already mentioned. They are called ſigns becauſe they ſerve as marks to diſtinguiſh the ſun's place in the ecliptic: and their number was limited to twelve, becauſe, during the ſun's paſſage through the ecliptic, there are 12 lunations, which it is probable were the earlieſt methods in uſe for meaſuring time, except the alternate ſucceſſion of day and night. But as twelve lunations are a few days ſhorter than the ſolar year, and as mankind were inclinable from habit to have the year, after its length was more accurately aſcertained, ſtill divided as before into twelve months; they were obliged to obſerve the ſun's annual path through the heavens, and divide it as nearly as poſſible into twelve equal parts, by noticing the moſt remarkable ſtars which were either in or near thoſe parts. Hence came the twelve ſigns, the ſeveral names of which have been already accounted for. Their characters ſeem to be imperfect hieroglyphical outlines of the creatures whoſe names they bear. Thus, ♈ is a ſketch of the horns of the Ram; ♉ is the fore-part of a Bull's Head; ♊, or rather ♓, is a union of the heads of two Kids; ♋ denotes the two fore-claws of a crab; ♌ repreſents the head and tail of a lion, with his back riſing into a kind of arch, as it is ſaid to do when the creature is preparing to ſpring upon its prey; ♍ is the body of a virgin, with an ear of corn in her left hand; ♎ is nothing but the beam of a balance; ♏ is a ſlight ſketch of the paws, long tail, and ſting of a Scorpion; ♐ is the arrow of an archer or hunter; ♑ repreſents the horns, back, and tail of a Goat; ♒ expreſſes a current of Water; and ♓ is the picture of two Fiſhes tied back to back*.

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* This will be more perfectly underſtood from the account of the motions of the planets in part the fourth.

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* The characters or ſymbols of all the twelve ſigns, excepting *Leo*, *Virgo*, and *Capricorn*, have been accounted

Next to the ecliptic, and zodiac, comes the *Meridian*, which is a great circle paſſing through any given place and the two poles of the earth. We may imagine as many ſuch meridians as we pleaſe; becauſe any place, which is ever ſo little to the eaſt or weſt of any other place, muſt have a different meridian. Every meridian is divided into two ſemicircles: that which paſſes through the given place is called the *geographical*, or *upper* meridian; and the oppoſite one, under the wooden horizon, is called the *lower* meridian. When the diurnal rotation of the earth, round its axis, brings the geographical meridian of any place to the ſun, it is then *meridies* or mid-day at that place (which is the reaſon why the meridian is ſo called:) but to all places then under the lower meridian it will be *midnight*. It is eaſy to conceive from hence, that the meridian muſt always divide the globe into the eaſtern and weſtern hemiſpheres; and that all places, under the ſame *geographical* meridian, muſt have their noon, and conſequently their other hours, at the ſame time.

As the fixing a firſt meridian (or that from which all other meridians, or the eaſtern and weſtern diſtances of places, are counted) is a matter purely arbitrary, the moderns have generally aſſumed the meridian of the capital city of their own country; ſo that the meridian of Lon-

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accounted for in the manner here ſpecified in the *Spectacle de la Nature*, or Nature Diſplayed: but although the manner in which I have accounted for the characters of thoſe three ſigns, is entirely new (no account having been yet given of them that I have hitherto met with) I flatter myſelf that it will not be condemned as either unnatural, or improbable.

don will be the firſt meridian with us. Accordingly, on our modern terreſtrial globes, beſides the figures above the equator, which ſpecify the number of degrees from the firſt of *Aries*, there are likewiſe other figures below the equator, increaſing by tens, both on the eaſtern and weſtern ſide, to 180 degrees each way, from the meridian of London.

The diſtance on the equator, between the meridian of any given place and the firſt meridian, and counted by the figures laſt mentioned, is called the *longitude* of that place; and this is ſaid to be either *eaſtern* or *weſtern* longitude, as the given place lies eaſt or weſt from the firſt meridian.

As the particular meridians of all the different places which are ſpecified upon the globe, could not be actually delineated upon its ſurface, without the greateſt inconvenience and confuſion, the globe is hung in a braſs ring, called the *brazen meridian*, and turns within it, either to the eaſt or weſt, upon a wire-axis. The eaſtern edge of the ring is divided into 360 equal parts, or degrees: 90 of thoſe degrees are numbered by tens, from the equator to the north pole, and 90 more from the equator to the S. pole: the remaining 180, on the oppoſite half of the ring, are reckoned from each of the poles to the equator, where the two quarters end at 90. This brazen ring, by turning the globe till any given place comes to the eaſtern or graduated edge of it, will ſerve for the meridian of that place; and, in the ſame manner, it may occaſionally become the meridian of any other place.

The diſtance of any place from the equator, meaſured in degrees upon the meridian of that place, is called its *latitude*; which is ſaid to be either *north* or *ſouth* latitude, according as the place is ſituated on the north, or ſouth ſide of the equator. As the latitudes of different places, and the declination of the ſun and ſtars, are found mechanically by the help of the brazen meridian, the graduated ſide of it ſhould be generally kept towards us, in working problems by the globes.

Though, philoſophically ſpeaking, no point either in the heavens, or upon the ſurface of the earth, is either *uppermoſt* or *loweſt*; yet, with reſpect to ourſelves, that point upon which we ſtand is conſidered as the *top*, or *higheſt* part of the globe, and the oppoſite point as the *bottom*, or *loweſt* part of it. It is in conformity to this relative view of the earth's ſurface, that we define the *Horizon* of any place to be a great circle in the heavens, the plane of which paſſes through the center of the globe, and divides it into the upper and lower hemiſpheres. This is called the *rational*, or *philoſophers* horizon. There is likewiſe a *ſenſible* horizon; which is that great circle in the heavens which terminates our view on every ſide, when we ſtand upon an open plane: by this the heavens are divided into two hemiſpheres, one of which is viſible to the eye, and the other concealed by the convexity of the earth. I call them *hemiſpheres*, becauſe as the earth, when compared with the immenſe diſtance of the ſtarry heavens, is a mere point; the planes of the *rational* and *ſenſible* horizon, though they are really ſeparate from and parallel to each other, may be conſidered as coincident.

The earth being a ſpherical body, it will not be difficult to conceive that the horizon, both *rational*

tional and *ſenſible*, muſt continually vary as we move from place to place. To enable us, therefore, to ſhew the horizon of any place mechanically upon the artificial globes, the brazen meridian abovementioned is let into two notches in a flat wooden ring, which is called the *wooden horizon*, in ſuch a manner that to whatever degree we elevate, or depreſs either of the poles, the globe will be conſtantly divided, by the wooden horizon, into the upper and lower hemiſpheres. On this wooden horizon are ſeveral concentric circles, which contain the months and days of the year, the ſigns and degrees anſwering to the ſun's place for each day, and the thirty two points of the compaſs.

As that point of the earth's ſurface upon which we ſtand, and likewiſe the oppoſite point, will always be equally diſtant from every part of the true or rational horizon; if we imagine a line to be drawn through the center of the earth, from one of thoſe points to the other, and to be produced both ways till it reaches the ſtarry heavens, the two extremities of that line, ſo produced, will be the upper and lower poles of the horizon. The upper pole, or that point in the heavens which is directly over our heads, is called the *Zenith*: and the lower pole, or oppoſite point, is called the *Nadir*. Accordingly, when any of the heavenly bodies comes to the upper pole of the horizon, it is ſaid to be *in the zenith*, or to be *vertical*: and if it appears in any intermediate point, between the zenith and horizon, the arc which is intercepted between that point and the zenith, is called the *zenith diſtance*; and the remaining arc, between the given point and the horizon, is called the *altitude* of the heavenly body. If the latter of thoſe arcs, or that between the luminary and the horizon, coincides with the meridian of the place where we are, it is then called the *meridian altitude*; and the ſun or ſtar is then ſaid to *culminate*, or come to the meridian. The word *culminate* (from *culmen*, the top or ſummit) is here made uſe of, becauſe when the ſun, or a ſtar, comes to the meridian of any place, it will then be at its greateſt height above the horizon of the given place for that day: accordingly, in whatever part of the world we are (excepting the two poles) the ſun will conſtantly be higheſt at noon.

The apparent path of the ſun through the heavens, from his riſing to his ſetting, upon any given day of the year, is called his *diurnal arch*; which may be eaſily repreſented with an artificial globe, by bringing the place of the obſerver to the zenith, and then turning that degree of the ecliptic, which the ſun is in upon the given day, from the eaſtern edge of the horizon to the weſtern. That part of the ſun's diurnal path which is included between the horizon and meridian, is called the *ſemidiurnal arch*; and that part of his daily courſe, which he deſcribes from his ſetting to his riſing, is called the *nocturnal arch*.

The two next great circles are the two *Colures*, which paſs through both the poles of the earth, and there interſect each other at right angles, and, conſequently, divide the ecliptic into four equal parts or quadrants. One of them paſſes through the two equinoctial points, in Aries and Libra, and is therefore called the *equinoctial colure*: and the other paſſes through the two ſolſtitial points, in *Cancer* and *Capricorn*, and is therefore called the *ſolſtitial colure*. They are called *colures* from the Greek word Κολουροι, *caudâ mutili*, without a tail, *i. e.* imperfect; becauſe to whatever poſition you reduce the globe, a part of them is always loſt under the horizon. The uſe of them is to mark out the beginning, and ending of the four ſeaſons of the year.

To the ſix greater circles already deſcribed, we may add the *hour circles*, or *meridians*; the *Azimuths*, or *vertical circles*, alſo called *Rhumbs*; and the *circles of longitude* of the ſtars and planets.

The *hour circles*, or *meridional lines*, divide the equator into 24 equal parts, each containing 15 degrees. As the ſun, therefore, appears to move round the earth, from eaſt to weſt, once in 24 hours; thoſe places, whoſe geographical meridian is 15 degrees eaſtward from that of any other place, have their noon, and every other hour, an hour ſooner; but thoſe, whoſe meridian is 15 degrees weſtward from that of the given place, have their noon, and every other hour, an hour later; and ſo on in proportion, reckoning an hour for every 15 degrees.

The *Azimuths*, or *vertical circles*, are imaginary great circles, which paſs through the *zenith* and *nadir* of any place, or through both the poles of the Horizon. It is on theſe we reckon the altitude of the ſun or ſtars, when they are not upon the meridian. When 32 of theſe circles are deſcribed on the terreſtrial globe, or a map, at equal diſtances, they are generally called *Rhumbs*, and determine the diſtances, and bearings of different places from any other given place. They are mechanically repreſented by the quadrant of altitude, which we ſhall hereafter

after deſcribe. That vertical circle which cuts the meridian of any place at right angles, and paſſes through the eaſtern and weſtern points of the Horizon, is called the *prime vertical.*

The *Circles of Longitude* of the ſtars, and planets, are great circles which paſs through the poles of the ecliptic, and cut the Ecliptic itſelf at right angles, in the ſame manner as the hour-circles do the Equator. They belong to the celeſtial globe, and it is by theſe we determine the *longitude* of the ſtars, or their diſtance on the Ecliptic from the firſt of *Aries.*

II. Of the LESSER CIRCLES.

The moſt remarkable of the leſſer circles (which, as we have already obſerved, divide the globe into two unequal parts) are the two *Tropics,* and the two *polar circles.*

The two *Tropics* are leſſer circles in the heavens, which juſt touch the Ecliptic in the two ſolſtitial points, and are parallel to the Equinoctial, and conſequently 23 ½ degrees diſtant from it, the one on the north ſide, and the other on the ſouth. That on the north ſide, as touching the Ecliptic at the beginning of *Cancer,* is called the *Tropic of Cancer* ; and that on the ſouth, for a ſimilar reaſon, the *Tropic of Capricorn.* They are both called *Tropics* from the Greek word τρεπω, *verto,* to turn or change ; becauſe when the Sun comes to either of them, he ſhifts or changes his courſe, and returns to the Equinoctial again.

The two *polar circles* are likewiſe two leſſer circles in the heavens, which are parallel to the Equinoctial, and 23 ½ degrees diſtant from their reſpective poles. That which goes round the north pole is called the *Arctic Circle*, from the greek word ἄρκτος, *a Bear*; becauſe it croſſes part of a conſtellation which bears that name. The other, which goes round the ſouth pole, is called the *Antarctic Circle*; from ἀντι *contra*, or over againſt, and ἄρκτος *the Bear*; becauſe it is oppoſite to the former.

By theſe four circles the ſurface of the earth is divided into five *Zones*, or Belts, (ζωναι:) viz. the *torrid* or ſultry Zone, which lies between the two Tropics, and was anciently ſuppoſed to be too hot to be conveniently inhabited: the two *temperate* Zones, one of which lies between the Tropic of Cancer and the Arctic Circle, and the other between the Tropic of Capricorn, and the Antarctic Circle; and, laſtly, the two *frigid* Zones, ſo called becauſe they are intenſely cold, one of which lies between the Arctic Circle and the north pole, and the other between the Antarctic Circle and ſouth pole.

To the above leſſer circles we may add the *Parallels of Latitude*, either of particular places on the earth, or of the ſtars; the *Parallels of Declination* of the Sun and Stars; the *Almacanthers*, or *Parallels of Altitude*; and the *Circles of perpetual Apparition, or Occultation.*

The *Parallels of Latitude* of different places on the earth, are circles parallel to the Equator, and infinite in number; becauſe every place, which is farther north or ſouth than another, has a different parallel. But on the artificial globes, the parallels are generally deſcribed at the diſtance of 10 degrees from each other. It is almoſt needleſs to obſerve, that the parallels muſt continually grow leſs the more they approach the poles.

The parallels of latitude *of the ſtars*, on the celeſtial globe, are leſſer circles parallel to the Ecliptic, in the ſame manner as the parallels of places are to the Equator, and may be repreſented by the diviſions on the Quadrant of Altitude, in its motion round the globe, when ſcrewed to the pole of the Ecliptic. It is evident from hence that the *Latitude* of a ſtar, or planet, is it's diſtance from the Ecliptic, meaſured on one of the Circles of Longitude before-mentioned which paſs through the Poles of the Ecliptic, and that it is either *north* or *ſouth* Latitude, according to which Pole of the Ecliptic the ſtar is neareſt.

The *Parallels of Declination* of the Sun, and Stars, are leſſer circles parallel to the Equinoctial, in the ſame manner as the Parallels of Latitude, on the terreſtrial Globe, are to the Equator.

The *Almicanthers*, or *Parallels* of *Altitude*, are imaginary leſſer circles, which are parallel to the Horizon of any place. They may be imagined to paſs through every degree and minute of the Meridian, between the Horizon and the Zenith; and may be repreſented on the globe by the diviſions on the Quadrant of Altitude, in its motion round the globe, when ſcrewed to the Zenith.

The *Circle of perpetual Apparition* is an imaginary leſſer circle, on the celeſtial globe, which is parallel to the Equinoctial, and deſcribed by the revolution of any point which juſt touches the northern part of the Horizon, at any given elevation of the north pole; or *vice verſa*. The ſtars which are included within this circle never ſet.

The *Circle of perpetual Occultation* is an imaginary leſſer circle, on the celeſtial globe, which is parallel to the Equinoctial, and at the ſame diſtance from it, on the oppoſite ſide, as the Circle of perpetual Apparition. All the ſtars between this circle, and its reſpective pole, never riſe.

III. Of the CLIMATES.

The *Climates* are imaginary Belts, or ſmall Zones, upon the ſurface of the earth, each of which is bounded by two circles, which are parallel to the Equator, and at ſuch a diſtance from each other, that the longeſt day in any part of the ſmalleſt of the two circles, except they be beyond the polar Circle, (where the longeſt day is 24 hours) is exactly half an hour longer than in the largeſt circle. It is evident from hence, that there are 24 Climates between the Equator, and each of the polar Circles: becauſe 12 hours, which is the difference of time between the longeſt day at the Equator and at the polar Circles, are equal to 24 half hours. From the polar Circles the longeſt days increaſe a month in every ſucceſſive Climate, till you come to the poles, where the longeſt day is ſix months: ſo that between each of the polar Circles, and its reſpective pole, there are ſix Climates. It is therefore plain, that there muſt be ſixty Climates in the whole; for twice 24 makes 48, and twice 6 makes 12; and 12, added to 48, amounts to 60.

In the annexed table I have given a liſt of all the Climates, with their reſpective Latitudes, and Breadths.

CLI-

CLIMATES between the EQUATOR and POLAR CIRCLES.

Climates.	Hours.	Latitude.		Breadth.		Climates.	Hours.	Latitude.		Breadth.	
		D.	M.	D.	M.			D.	M.	D.	M.
1	12½	8	25	8	25	13	18½	59	58	1	29
2	13	16	25	8	00	14	19	61	18	1	20
3	13½	23	50	7	25	15	19½	62	25	1	07
4	14	30	25	6	30	16	20	63	22	0	57
5	14½	36	28	6	08	17	20½	64	06	0	44
6	15	41	22	4	54	18	21	64	49	0	43
7	15½	45	29	4	07	19	21½	65	21	0	32
8	16	49	01	3	32	20	22	65	47	0	22
9	16½	52	00	2	57	21	22½	66	06	0	19
10	17	54	27	2	29	22	23	66	20	0	14
11	17½	56	37	2	10	23	23½	66	28	0	08
12	18	58	29	1	52	24	24	66	31	0	03

CLIMATES between the POLAR CIRCLES and the POLES.

Length of Days.	Latitude.		Length of Days.	Latitude.	
Months.	D.	M.	Months.	D.	M.
1	67	21	4	78	30
2	69	48	5	84	05
3	73	37	6	90	00

IV. Of the different Poſitions of the SPHERE.

All the different poſitions of which the Sphere, or artificial Globe, is capable, in a geographical ſenſe, are but three; and, according to theſe, it is denominated either a *right ſphere*, a *parallel ſphere*, or an *oblique ſphere*.

In a *right ſphere*, both the Poles are poſited in the Horizon; the Equator paſſes through the Zenith and Nadir, and the Equator, and all Circles which are parallel to it, interſect the Horizon at *right* angles.

In a *parallel ſphere*, the two Poles form the Zenith and Nadir; and the Equator, Parallels of Latitude, Tropics, and polar Circles, are all *parallel* to the Horizon.

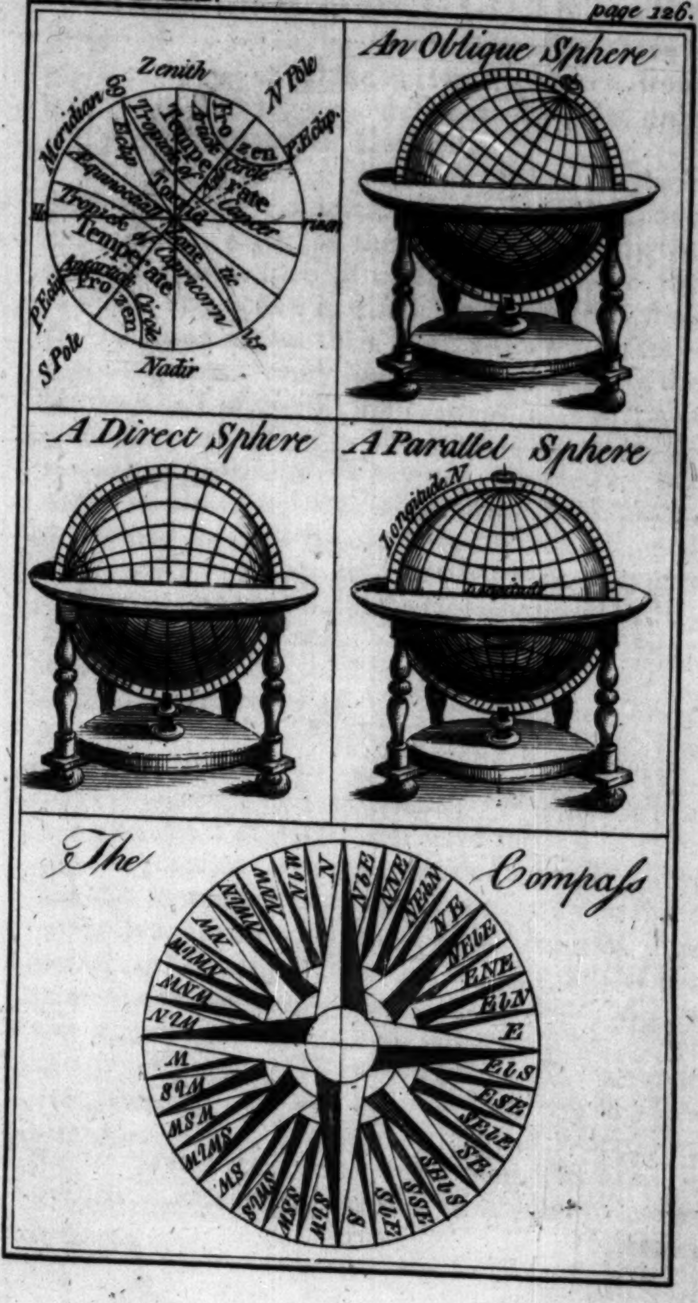
In an *oblique ſphere*, the Poles are neither in the Horizon, nor in the Zenith and Nadir; and, conſequently, the Equator, and all the Circles which are parallel to it, muſt cut the Horizon *obliquely*, or not at all.

Though the properties of theſe different kinds of ſpheres cannot be thoroughly underſtood, till the learner has gone through the Problems to be ſolved upon the Globes hereafter; yet as they naturally belong to this ſection, we ſhall here take the liberty to mention them; leaving it to the diſcretion of the teacher, to refer to them when he thinks it moſt proper.

The inhabitants of the *right Sphere*, are thoſe who live under the Equinoctial. They have their days and nights always equal, each conſiſting of 12 hours. They have two winters, and two ſummers every year. They have leſs twilight than in any other part of the world; becauſe their ſun always ſets in a perpendicular direction to the Horizon: and as they have no Circle, either of perpetual

PLATE. III.

page 126.



An Oblique Sphere

A Direct Sphere

A Parallel Sphere

The Compass

BRITISH MUSEUM
31 AUG 48

perpetual apparition or occultation, they have a glorious diſplay of all the ſtars in the heaven, from pole to pole, though the ſtars near the poles only juſt appear above their Horizon.

The inhabitants of the *parallel Sphere* are thoſe who live under the poles. They have but one day, and one night, in the year. They enjoy the longeſt continuance of twilight, both after the ſun ſets, and before he riſes. In the winter, they ſee the moon above their Horizon a whole fortnight together, every lunar month; becauſe the ſummer half of the Ecliptic, in which the moon is conſtantly viſible in the winter, is poſited above their Horizon. They can ſee no ſtars but thoſe in the northern, or ſouthern hemiſphere, according to which pole they live under; and thoſe neither riſe nor ſet, but conſtantly appear at the ſame height above the Horizon: and, laſtly, they have all the planets half their time conſtantly above the Horizon, and the other half below it.

The inhabitants of the *oblique Sphere* never have their days and nights equal, but when the ſun is in *Aries* or *Libra*. They have more twilight in ſummer than in winter. Thoſe who live without the Tropics, never have the ſun in their Zenith; but to thoſe who live under the Tropics, the ſun is vertical once a year, and twice to thoſe who live between them. They ſee the ſtars riſing and ſetting obliquely; and the nearer the obſerver is to the Equator, the greater will be the number of ſtars which fall within his view. Their twilight will be longeſt in the greateſt latitudes, and as their full moons in the ſummer are always in the winter ſigns, and *vice verſa*, the moon's viſible courſe through the heavens will be much higher, and longer in winter than in ſummer, which muſt be of great uſe in that dreary ſeaſon, and is a ſtriking proof of the great wiſdom and goodneſs of the Father of the univerſe.

V. Of the different diviſions of the inhabitants of the earth, with reſpect to their ſituation, and the direction of their ſhadows.

The inhabitants of the earth are divided, with reſpect to their different ſituations, into the *Periæci*, the *Antæci*, and the *Antipodes*.

The *Periæci* are thoſe who have the ſame Latitude, but oppoſite Longitudes. Conſequently, the length of the days and nights, and the ſeaſons of the year, muſt be the ſame with our *Periæci* as with us; but they have contrary hours, *i. e.* when it is noon with us, it is midnight with them, and ſo on with reſpect to the other hours.

The *Antæci* are thoſe who have the ſame Longitude as we have, but an oppoſite Latitude. Our *Antæci*, therefore, have the hours of their day the ſame as ours; but their ſummer is our winter, and *vice verſa*; and, conſequently, the days and nights with them are ſhorteſt when they are longeſt with us.

The *Antipodes* are thoſe who have oppoſite Latitudes, and Longitudes. Our *Antipodes*, therefore, have their hours, the comparative lengths of their days and nights, and their winter and ſummer, directly contrary to ours.

With reſpect to their *ſhadows*, the inhabitants of the earth are divided into the *Amphiſcii*, the *Heteroſcii*, the *Periſcii*, and the *Aſcii*.

The *Amphiſcii* are thoſe whoſe ſhadows, at noon-day, fall directly ſouth one part of the year, and directly north the other: it is therefore evident, that they are ſituated between the Trop ic

The *Heteroſcii* are thoſe whoſe ſhadows, at noon. are always either directly north, or directly ſouth, They are, therefore, ſituated in one of the Temperate Zones.

The *Periſcii* are thoſe whoſe ſhadows, at one part of the year (viz. in their ſummer) move intirely round them, in the ſpace of 24 hours. The reaſon is, becauſe they have the ſun conſtantly above their Horizon, for ſeveral days or months together; it is therefore evident, that they are ſituated within the polar Circles.

The *Aſcii* are thoſe who, at noon, have no ſhadow at all, once or twice every year. The people who live directly under the Tropics, are *Aſcii* (or without any ſhadow at noon) one day in the year; and thoſe who live between the Tropics are *Aſcii* twice a year. The reaſon is, becauſe at thoſe times they have the ſun vertical, or in their Zenith (i. e. directly over their heads) at mid-day.

VI. An EXPLANATION of ſeveral uſeful terms, which are not included in the definitions already given.

The *Amplitude* of the ſun, or a ſtar, is an arch of the Horizon intercepted between the eaſtern or weſtern point thereof, and the center of the luminary, at the moment of its riſing or ſetting; or, in other words, it is that point of the Compaſs in which the luminary riſes or ſets. We may therefore call the former its *eaſtern*, and the latter its *weſtern* Amplitude.

The *Azimuth* of the ſun, or a ſtar, is an arch of the Horizon intercepted between the meridian of any place, and an Azimuth, or vertical Circle, which paſſes through the center of the luminary at any time when it appears above the Horizon. In other words, it is that point of the Compaſs in which the luminary appears; or its diſtance from the meridian, or ſouth point, at any of the intermediate hours between its riſing and ſetting.

The *right Aſcenſion* of the ſun, or a ſtar, is an arch of the Equinoctial intercepted between the firſt of *Aries*, and a Meridian which paſſes thro' the center of the given luminary; or, vulgarly ſpeaking, it is that degree of the Equinoctial (counting from the beginning of *Aries*) which comes to the Meridian together with the ſun's place, or with any given ſtar.

The *oblique Aſcenſion* of the ſun, or a ſtar, is an arch of the Equinoctial, intercepted between the firſt of *Aries* and the Horizon, when the given luminary is *riſing*.

The *Aſcenſional Difference* is the difference between the right and oblique Aſcenſion.

The *oblique deſcenſion* of the ſun, or a ſtar, is an arch of the Equinoctial, intercepted between the Horizon and the firſt of *Aries*, (or that degree of the Equinoctial which is cut by the Horizon) when the given luminary is *ſetting*.

VII. Of the APPENDANTS belonging to the GLOBES.

The Appendants belonging to the Globes are the *Hour Circle and Index*, the *Quadrant of Altitude*, the *Semicircle of Poſition*, and the *nautical Box*.

The *Horary Circle* is a ſmall Circle of braſs, divided into 24 hours, and ſcrewed on the brazen Meridian, round the north pole, ſo that the XII o'clock lines at noon and midnight coincide with the graduated edge of the Meridian. The *Index*, or hour hand, is fixed on the extremities of the Axis, ſo as to be occaſionally moveable, and yet turn uniformly round with the globe. Its uſe is to ſhew the time of the riſing and ſetting of the ſun or ſtars, and the difference of time in the different parts of the world.

The *Quadrant of Altitude* is a pliable ruler of braſs, divided into 90 equal parts, or degrees, of the ſame length as thoſe on the Equator or Equinoctial. It hath a nut and ſcrew at one end, to fix it to the brazen Meridian; and the 90 degrees above-mentioned commence at the other end. Its uſe is to determine the Altitudes and Azimuths of the ſun and ſtars, and the diſtances and bearings of places from each other.

The *Semicircle of Poſition* is a kind of double Quadrant of Altitude, being 180 degrees in length, and anſwering to one half of the Equator: but the Quadrant of Altitude, or the Horizon, generally ſupply its place.

The *Nautical Box*, or Mariners Compaſs, is an inſtrument too well known to need any deſcription, and is occaſionally uſed to place the Globe due north and ſouth. The card contains a Circle, which is divided into 32 equal parts by as many lines or rhumbs. The North, South, Eaſt, and Weſt points are called the four *Cardinal Points*. The names of the remaining 28 points are ſpecified in the annexed figure. * If we place ourſelves in ſuch a poſition as to look full towards the Eaſt, our right ſhoulder will then point to the

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* Vid. Plate. III.

the South, our left to the North, and the Weſt will be directly behind us.

VIII. Directions for chooſing GLOBES.

See that the papers with are paſted on the Globe are ſo exactly matched, that the lines and circles meet as they ought to do; and that the colours are not laid on ſo thick as to hide the names of the different places.

See that the Globe is as cloſe to the wooden Horizon, and brazen Meridian, as it conveniently may: for it would, otherwiſe, be difficult to determine to what degree of either any particular point on the Globe is oppoſite.

See that the Equator, or Equinoctial, coincide exactly with the Horizon when either Pole is brought to the Zenith; and that, in all elevations, it cuts the Horizon in the eaſt and weſt points.

See that the degree of the brazen Meridian marked O, be exactly over the Equator or Equinoctial; and that exactly one half of the brazen Meridian always riſes above the Horizon.

See that, when the Quadrant of Altitude is ſcrewed to the Zenith, the figure O, denoting the beginning of the degrees, always coincides with the Horizon as the Quadrant moves round.

See that during the hourly motion of the index, as the Globe turns round, 15 degrees of the Equator conſtantly paſs under the graduated edge of the Meridian.

See that the wooden Horizon be made firm and ſtrong, this being uſually the firſt part that fails; and that the legs which ſupport it are ſo ſubſtantial, and well fixed, as to keep the Globe ſteady in any poſition.

SECTION IX.

PROBLEMS, ſome of which are peculiar to the terreſtrial Globe, and ſome common to that and the celeſtial Globe.

PROB. I. *To find the Latitude and Longitude of any given place?*

Turn the Globe till you have brought the given place under the graduated edge of the brazen Meridian; the latitude of the place (whether it be *north* or *ſouth*) will then be that degree of the Meridian which lies directly over it; and that degree of the Equator which is cut by the Meridian is the true Longitude of the place, either eaſt or weſt.

PROB. II. *To find any place whoſe Latitude and Longitude are given?*

Bring the given degree of Longitude, upon the Equator, to the graduated edge of the brazen Meridian; and then under the given Latitude, as ſpecified on the Meridian, you'll find the place required.

You may ſelect plenty of examples for this and the proceeding Problem, from the Geographical Tables in Part the firſt.

PROB. III. *To find all thoſe places which have the ſame Longitude, or Latitude, as any given place?*

Bring the given place to the brazen Meridian; and then all thoſe places which lie under the ſame edge of the Meridian have the ſame Longitude; and, if you turn the Globe gently round, all thoſe places which you obſerve paſſing under the ſame degree of the Meridian have the ſame Latitude.

Prob. IV. *To find the difference of Latitude or Longitude between two given places?*

After finding the reſpective Latitudes and Longitudes of the two given places, as above directed, if the Latitudes are both *north*, or both *ſouth*, and the Longitudes both *eaſt*, or both *weſt*, ſubſtract the leſſer from the greater, and the remainder will be the difference required: but if the Latitudes are one *north*, and the other *ſouth*; or the Longitude of one place be *eaſt*, and the other *weſt*, the ſum of both the Latitudes, or both the Longitudes, will be the required difference of Latitude or Longitude between the given places.

Thus if the Latitude of one of the given places be 40 degrees N. and that of the other 30 degrees N. their difference of Latitude will be 10 degrees: but if one be 40 degrees N. and the other 30 degrees S. the difference will be 70. In the ſame manner, if the Longitude of one place be 40 degrees E. and that of the other 80 degrees W. their difference of Longitude will be 120 degrees; but if one be 40 degrees W. and the other 80 degrees W. the difference will be only 40 degrees.

Prob. V. *To find the Antæci, Periæci, and Antipodes to any given place?*

Bring the given place to the brazen Meridian, and then obſerving under what degree of Latitude it lies, and keeping the Globe in the ſame poſition, you will find the *Antæci* under the ſame degree of Latitude on the oppoſite ſide of the Equator.

If after this, ſtill keeping the given place under the brazen Meridian, you ſet the Index to XII at noon, and then turn the Globe till the Index points to XII at midnight; you will find the *Periæci* under the ſame degree of Latitude, on the ſame ſide of the Equator as the given place, and the *Antipodes* under the ſame Latitude on the oppoſite ſide.

It is evident from hence that thoſe who live at the Poles, if it were poſſible for any people to live there, can have no *Periæci*.

PROB. VI. *If the Hour of the Day be given at the place where you are, to find what o'clock it is in any other Part of the World?*

Bring the place where you are to the brazen Meridian, and then moving the index to the given hour, turn the Globe till any other place comes to the ſame ſide of the Meridian, and the index will ſhew what o'clock it is at that place.

Thus, when it is 2 in the afternoon at *London*, it will be 25 minutes paſt 4 in the afternoon at *Jeruſalem*; and almoſt 9 in the morning at *Port Royal* in *Jamaica*.

PROB. VII. *To find the Sun's place in the Ecliptic for any given Day of the Year?*

Look for the given day in the calendar on the wooden Horizon, and over againſt it you will find the ſign and degree the ſun is in, or his place in the Ecliptic, on that day at noon.

Thus you will find that, on *March* the 20th, the ſun enters the firſt degree of *Aries*; on *June* the 21ſt, the firſt of *Cancer*; on *September* 23d, the firſt of *Libra*; and on *December* 21ſt, the firſt of *Capricorn*.

The reverſe of this Problem, or when the ſun's place in the Ecliptic is given to find the day of the month, is too obvious to need an explanation.

PROB. VIII. *To find the Sun's Declination for any given Day of the Year, or to find the Month and Day by the Declination?*

When the day is given, find the ſun's place in the Ecliptic by the preceeding Problem; and then bringing that degree of the Ecliptic to the graduated edge of the brazen Meridian, the degree of the Meridian which is directly over it will be the Sun's Declination required. Thus on *April* the 21ſt, the ſun has 11 degrees, 30 minutes N. declination; but on *January* the 30th he has nearly 60 degrees S. declination.

When the *Declination* is given to find the day, turn the Globe gently round till ſome degree of the Ecliptic comes under that part of the brazen Meridian, which ſpecifies the given declination, whether N. or S: then look on the wooden Horizon for the degree of the Ecliptic thus found, and oppoſite to it you will ſee the month and day required. Thus if the given declination of the ſun be 23 degrees, 30 minutes N. the day required is the 21ſt of *June.*

N. B. If the ſun's declination be leſs than 23 degrees 30 minutes, there will conſtantly be two days in the year on which the ſun has the given declination; becauſe two different parts of the Ecliptic will then paſs under the degree of declination, as ſpecified upon the Meridian, and thoſe two parts of the Ecliptic will always be equally diſtant from the ſolſtitial points. But when the ſun is in the firſt degree of *Aries*, or *Libra*, he has no declination. *Vide the Globes.*

PROB. IX. *When any Day of the Year is given, to find what other Day of the Year will be of the ſame Length?*

Find the ſun's declination for the given day, by the preceeding Problem; and then turning the Globe gently round, till ſome degree of the Ecliptic, which does not anſwer to the given day, paſſes under the ſame degree of declination, look for that degree of the Ecliptic upon the wooden Horizon, and oppoſite to it you will find the day of the year required. Thus *July* the 13th will be of the ſame length as *May* the 29th.

PROB. X. *To find where the Sun is vertical, and at what places it is noon, on any given Day and Hour: or, if a Place in the torrid Zone is given, to find when the Sun will be vertical there?*

To find *where* the ſun is vertical at any given time, firſt find the ſun's declination for that day; then bringing the place where you are to the brazen Meridian, and ſetting the index to the given time, turn the Globe till the index points to the upper XII, and under that degree of the Meridian which ſpecifies the ſun's declination already found, you will find the place where the ſun is vertical on the given day and hour; and it will likewiſe be noon at all thoſe places which are then under the Meridian. We may add, that to all thoſe places which paſs under the degree of declination already found, the ſun will be vertical on thoſe hours of the given day which are ſucceſſively ſpecified by the index, after bringing the place where you are to the brazen Meridian, and ſetting the index to the upper XII; but in this caſe, all the afternoon hours, 1, 2, 3, 4, &

4, &c. are to be reckoned 1, 2, 3, 4 hours before noon, and the morning hours are to be accounted ſo many hours before midnight; i. e. for inſtance, if the index points to IV in the afternoon it ſignifies *four* hours before noon, or VIII in the morning; if it points to V in the morning, it ſignifies *five* hours before midnight, or VII in the evening.

To find *when* the ſun will be vertical at any given place between the two Tropics, find the latitude of that place, and then as you turn the Globe gently round, thoſe two degrees of the Ecliptic which paſs under the obſerved degree of latitude, will determine the *two days* of the year on which the ſun is vertical at the given place. If you would likewiſe find the *hour* when he is vertical there, bring the given place to the meridian, and then ſetting the index to the upper XII, and bringing the place where you are to the meridian, the index will ſhew the hour required.

Example. The ſun is vertical at *Candy*, in the iſland of *Ceylon*, at about half an hour paſt our 6 in the morning on *April* the 12th, and *Auguſt* 28th.

Prob. XI. *To reduce the length of any given part of any of the Parallels of Latitude to an equivalent number of Degrees upon the Equator?*

Take off the length of the given part, or arch of the given parallel, with a pair of compaſſes, and then applying the length ſo taken to the Equator, you will find the number of equatorial degrees required. The annexed table, ſhewing the number of geographical miles in a degree of longitude for each parallel of latitude (reckoning 60 miles to a degree) will furniſh a ſufficient variety of examples.

A
TABLE
SHEWING
The Number of Miles contained in a Degree of Longitude, in each Parallel of Latitude from the Equator.

Degrees of Latitude.	Miles.	100th Part of a Mile.	Degrees of Latitude.	Miles.	100th Part of a Mile.	Degrees of Latitude.	Miles.	100th Part of a Mile.
1	59	96	31	51	43	61	29	04
2	59	94	32	50	88	62	28	17
3	59	92	33	50	32	63	27	24
4	59	86	34	49	74	64	26	30
5	59	77	35	49	15	65	25	36
6	59	67	36	48	54	66	24	41
7	59	56	37	47	92	67	23	45
8	59	40	38	47	28	68	22	48
9	59	20	39	46	62	69	21	51
10	59	08	40	46	00	70	20	52
11	58	89	41	45	28	71	19	54
12	58	68	42	44	95	72	18	55
13	58	46	43	43	88	73	17	54
14	58	22	44	43	16	74	16	53
15	58	00	45	42	43	75	15	52
16	57	60	46	41	68	76	14	51
17	57	30	47	41	00	77	13	50
18	57	04	48	40	15	78	12	48
19	56	73	49	39	36	79	11	45
20	56	38	50	38	57	80	10	42
21	56	00	51	37	73	81	09	38
22	55	63	52	37	00	82	08	35
23	55	23	53	36	18	83	07	32
24	54	81	54	35	26	84	06	28
25	54	38	55	34	41	85	05	23
26	54	00	56	33	55	86	04	18
27	53	44	57	32	67	87	03	14
28	53	00	58	31	79	88	02	09
29	52	48	59	30	90	89	01	05
30	51	96	60	30	00	90	00	00

Prob. XII. *To find the Latitude of that Part of the North frigid Zone, in which the Sun will not ſet during any given Time not exceeding 6 Months; or when the Latitude of any Place in the North frigid Zone is given, to find the beginning and ending of their longeſt Day or Night, and conſequently the length of either?*

When the *number of days* is given to find the latitude, divide that number by two, (i. e. take the half of it) and reckoning ſo many degrees on the ecliptic from the firſt of cancer, bring that point or degree of the ecliptic where your reckoning ends to the brazen meridian, and then obſerving its declination, or diſtance from the equator, and ſubſtracting it from 90, the remainder will be the latitude required: or, to ſave the trouble of ſubſtracting, ſlide the meridian up or down, till the ſouth or oppoſite degree of declination comes to the ſouth point of the horizon, and you will then find the latitude required on that degree of the meridian which cuts the north point of the horizon.

If ſome *particular day* of the year is given, between the 21ſt of *March*, and 21ſt of *June*, to find the latitude of that part of the frigid zone in which the longeſt day then commences, or where the ſun begins to ſhine without ſetting, find the *declination* of the ſun for the given day by problem the 8th, and then proceed as in the foregoing article.

When the *Latitude* of any place, in the frigid zone, is given to find the beginning and ending of the longeſt day in that place, ſubſtract the given latitude from 90, and the remainder will be the declination of the ſun for thoſe two days, on which the required longeſt day begins and ends. The declination thus found, you may afterwards find the days themſelves by Problems the 8th, and 9th.

It is evident from hence, that the longeſt day and longeſt night muſt be of the ſame length; and, conſequently, that during all the intermediate days (if there are any) between the ending of the longeſt night and the beginning of the longeſt day, or between the ending of the longeſt day and beginning of the longeſt night, the Sun will riſe and ſet once in 24 hours, as he does with us.

It will alſo be eaſy to conceive from what has been ſaid, how any part of this Problem may be ſolved for the South Frigid Zone.

PROB. XIII. *To rectify the Globe for the Latitude, Zenith, and Sun's Place?*

To rectify for the *Latitude*, find the latitude of the given place (which is commonly the place where you are) by problem the 1ſt; and then, if the given place is in the northern hemiſphere, either raiſe or depreſs the north pole, till that degree of the northern quarter of the meridian, which anſwers to the degree of latitude already found, cuts the north point of the horizon. If the given place is in the ſouthern hemiſphere, the ſouth pole muſt be raiſed, in the ſame manner, above the ſouth point of the horizon, as many degrees as the latitude of the place amounts to.

To rectify for the *Zenith*, firſt rectify as above for the latitude, and then, bringing the given place to the meridian, ſcrew on the quadrant of altitude ſo that the chamfered edge may cut the given latitude.

To rectify for *the Sun's Place*, bring that degree of the ecliptic which the ſun is in, upon the given day, to the brazen meridian; and keeping the Globe firm in that poſition, ſet the index to the upper XII.

The Globe, when thus poſited, is ſaid to be *rectified*, becauſe it is then *rightly* prepared for ſolving moſt of the ſubſequent problems, for any given place.

PROB. XIV. *The Day and Hour at any Place being given, to ſhew the enlightened Hemiſphere, or where it is Day-light, Twilight, and Dark-night; and likewiſe all thoſe Places where the Sun is riſing, ſetting, or culminating?*

Find the place where the ſun is vertical, at the given time, by problem the 10th, and then, bringing that place to the graduated edge of the brazen meridian, rectify the Globe for it's latitude by the preceeding problem.

The globe being thus poſited;—to all that hemiſphere which is above the horizon, it is *Day-light*;—to all thoſe places which are leſs then 18 degrees below the horizon, it is *Twilight*;—and to thoſe places which are more degrees below the horizon, it is *dark-night*:—alſo, to all thoſe places which are ſituated along the weſtern edge of the horizon, the ſun is *riſing*;—to all thoſe places which lie under the upper half of the brazen meridian, the ſun is *culminating* (i. e. it is noon;)—and to all thoſe places which lie along the eaſtern edge of the horizon, the ſun is *ſetting*. We may add that to all thoſe places which lie under the lower half of the brazen meridian, it is *midnight*.

To render this problem ſtill more general, if, while the globe remains rectified for the latitude of the place where the ſun is vertical, (or for the ſun's declination on the given day) you bring any other place to the upper half of the brazen meridian, and then ſetting the index to the upper XII. bring that place to the eaſtern edge of the horizon, the index will ſhew you when the ſun *riſes* there; and if you bring it to the weſtern edge of the horizon, the index will ſhew the time of *ſun-ſetting*:—alſo, if you bring the place where the ſun is vertical to the brazen meridian, and then rectifying for the zenith, lay the quadrant of altitude over any other place, the degree on the quadrant which lies directly over the latter place, will give the true altitude of the ſun in that place for the given hour:—laſtly, to all thoſe places which do not fall below the horizon, as the globe turns round, the ſun does not ſet on the given day; and to thoſe which do not aſcend above it, the ſun does not riſe.

If a tranſit of Venus or Mercury ſhould happen at the given hour, bring the place where the ſun is vertical to the brazen meridian, as before, and then all the places along the weſtern edge of the horizon will ſee the phænomenon at ſun-riſing, all along the eaſtern at ſun-ſetting, and all under the meridian at noon, and ſo on for the intermediate places.

PROB. XV. *The Day and Hour of a Lunar Eclipſe being given, to find all thoſe Places to which it will be viſible?*

Rectify the globe for the latitude of the Antipodes of the place where the ſun is vertical at the given time, and bring the Antipodes to the brazen meridian;—the eclipſe of the moon will then be viſible to the upper hemiſphere, and to that only, at the time of her greateſt obſcuration; but to thoſe places which are in or near the horizon, ſhe will be either riſing or ſetting.

To explain the principle upon which this problem is ſolved, it muſt be obſerved that the moon is never eclipſed but when ſhe is full, or in the oppoſite part of the ecliptic to that in which the ſun is.

Prob. XVI. *The Latitude of any Place, not exceeding* 66½ *Degrees, and the Day of the Month being given; to find the time when the Sun riſes and ſets, and conſequently the length of the Day and Night?*

Rectify for the given latitude, and the ſun's place, by problem the 13th; then bringing the ſun's place in the Ecliptic to the eaſtern edge of the horizon, the index will ſhew you the time when the ſun riſes; and bringing the ſun's place to the weſtern edge of the horizon, the index will ſhew the time when the ſun ſets. You may find examples enough for each in the common Almanacks.

If you double the time when the ſun ſets, you will have the length of the day; and if you double the time when the ſun riſes, you will have the length of the night.

If you ſucceſſively take the firſt of *Cancer*, and the firſt of *Capricorn*, for the ſun's place, and rectify the globe as above, you may alſo, by this problem, find the time when the ſun riſes and ſets on the longeſt and ſhorteſt days of the year, in any given latitude; and conſequently, by the laſt article, determine the length of either of thoſe days, and their reſpective nights. You will find upon trial, that in every part of the world the longeſt day is equal to the longeſt night, and the ſhorteſt day to the ſhorteſt night.

This problem may likewiſe be ſolved for any place indifferently, in the manner already ſpecified under problem the 14th, without paying any regard to the latitude: viz. rectify the globe for the degree *of the* ſun's declination, whether it be N. or S. on the given day; and then bringing what place you pleaſe to the Meridian, and ſetting the index to the upper XII, afterwards bring the ſame place to the eaſtern and weſtern edges of the Horizon ſucceſſively, and the index will point out the time of ſun riſing, and ſun ſetting at that place, if it is ſituated between the Polar Circles.

It will here be neceſſary to remind the reader, that the longeſt day in the ſouthern hemiſphere is when the ſun enters the firſt of *Capricorn*, and in the northern when he enters the firſt of *Cancer*; and that the ſhorteſt day, in either hemiſphere, is when the ſun enters the oppoſite points of the Ecliptic, or the winter ſolſtitial points.

Prob. XVII. *The Latitude of any Place, and the Day of the Month being given; to find the Time when the Morning Twilight begins, or when the Evening Twilight ends?*

(1.) After rectifying for the given latitude, zenith, and ſun's place, by Problem the 13th, bring the ſun's place in the Ecliptic to the eaſtern edge of the Horizon, and then obſerving what degree of the Ecliptic touches the weſtern edge, (or is directly oppoſite to the ſun's place,) turn the globe gently towards the eaſt, till that degree is cut exactly by the 18th degree on the Quadrant of Altitude in the weſtern hemiſphere; as the ſun's place will then be brought 18 degrees below the eaſtern edge of the Horizon, the index will ſhew the time when the twilight begins in the morning.

(2.) Bring the degree of the Ecliptic which is oppoſite to the ſun's place to the eaſtern edge of the Horizon, and then turning the globe gently towards the weſt, till that degree is cut, as before, by the 18th degree on the Quadrant of Altitude in the eaſtern hemiſphere, the index will ſhew the time when the twilight ends in the evening.

The intermediate time between the ending of twilight in the evening, and the beginning of twilight in the morning, will be the true length of *dark night*.

It muſt however be obſerved, that between 49 and 66 ½ degrees of latitude, the twilight continues the whole night in the middle part of the ſummer, for ſeveral nights ſucceſſively; and that the nearer the latitude approaches to 66 ½ degrees, the greater will be the number of thoſe nights.

PROB. XVIII. *The Latitude of any Place, not exceeding 66 ½ Degrees, being given; to find in what Climate the Place is?*

Find the length of the longeſt day in that place by Problem the 16th, and ſubſtracting 12 hours from that length, the number of half hours in the remainder will ſpecify the climate required.

Or, rectify the globe for the given latitude, and bring the firſt of *Cancer* to the eaſtern edge of the horizon; then ſetting the index to the upper XII, and bringing the firſt of *Cancer* to the weſtern edge of the horizon, the number of half hours which the index has moved beyond the lower XII, will ſpecify the climate required.

Or, ſtill more generally, without paying any regard to the latitude of the place, rectify the globe for the ſun's declination in the firſt of *Cancer*, (which is 23½ degrees north) and then bringing any place whatſoever in the northern hemiſphere, between the Equator and Polar Circle, to the eaſtern edge of the Horizon, and ſetting the index to the upper XII, afterwards bring that place to the weſtern edge of the Horizon, and the number of half hours which the index hath moved beyond the lower XII, will ſpecify the climate.

It is almoſt unneceſſary to obſerve, that if the given place is in the ſouthern hemiſphere, you muſt elevate the *South* pole, and take the firſt degree of *Capricorn*, inſtead of the firſt of *Cancer*.

Prob. XIX. *The Latitude of any Place in either of the Frigid Zones being given; to find in what Climate the Place is?*

Find the length of the longeſt day in the given place by Problem the 12th; and then to 24 add the number of months in the longeſt day thus found, and 1, or unity, for the overplus days if there are any, and the ſum will ſpecify the climate required. Thus, if the longeſt day in the given place is found to be 170 days of 24 hours each, it will contain 5 months and 20 days over; if therefore to 24 (the number of climates between the Equator and either of the Polar Circles) you add 6, the ſum will be 30;

which ſhews that the given place is in the 30th climate, either north or ſouth, according to which hemiſphere the place belongs to.

PROB. XX. *To find in what Latitude the longeſt Day is of any given Length leſs than 24 Hours?*

According as the latitude is either north or ſouth, bring the firſt of *Cancer* or *Capricorn* to the brazen meridian, and elevate the correſponding Pole 66 ½ degrees above the Horizon, taking care to ſet the index to the upper, or mid-day XII. Then turn the globe eaſtward till the index points to half the given number of hours, and keeping the globe firm in that poſition, (*i. e.* from turning upon its axis,) ſlide the Meridian downwards, till *Cancer* or *Capricorn* comes to the edge of the Horizon; that degree of the Meridian which is then cut by the north, or ſouth, point of the Horizon, will ſpecify the latitude required.

PROB. XXI. *To find the Angle of Poſition, or the Diſtance and Bearing from a given Place to any other Place?*

Rectify for the latitude and zenith of the given place, by Problem the 13th; and then bringing the given place to the graduated edge of the Meridian, and keeping the globe firm in that poſition, lay the graduated edge of the Quadrant of Altitude over the other place: the intermediate number of degrees between the two places will ſpecify the diſtance between them, and that point of the compaſs, on the wooden Horizon, which is directly oppoſite to the quadrant, will ſhew the bearing from the given place to the other.

PROB.

PROB. XXII. *The Latitude of any Place, not exceeding* 66 ½ *Degrees, and the Day of the Month being given, to find the Sun's Amplitude?*

Rectify the globe for the given latitude, and bring the ſun's place in the Ecliptic, for the given day, to the eaſtern edge of the Horizon; that point of the Horizon which is then oppoſite to the ſun's place, or the number of degrees which the ſun's place is diſtant from the eaſtern point, will be the ſun's *riſing* or *eaſtern Amplitude.* If, after this, you bring the ſun's place to the weſtern edge of the Horizon, that point of the Horizon which is then oppoſite to the ſun's place, or the number of degrees which the ſun's place is diſtant from the weſtern point, will be the ſun's *ſetting* or *weſtern Amplitude.*

You will find by this Problem, that the ſun never riſes exactly in the eaſt, or ſets in the weſt, but when he is in the firſt of *Aries*, or the firſt of *Libra*.

PROB. XXIII. *The Latitude, Month, and Hour of the Day being given; to find the Sun's Altitude and Azimuth?*

Rectify the globe for the latitude, zenith, and ſun's place, by Problems the 13th and 7th; and then turning the globe till the index points to the given hour, and laying the Quadrant of Altitude over the ſun's place, the degree of the Quadrant which is cut by the ſun's place will be the ſun's *Altitude* at that time above the Horizon; and the number of degrees, which that point of the Horizon that is cut by the quadrant is diſtant from the ſouth point, will be the ſun's Azimuth.

If the given hour is 12 o'clock at noon, the ſun will be directly ſouth, and his altitude (which is then called his *meridian altitude*) muſt be meaſured on the brazen Meridian.

If the Quadrant of Altitude, when ſcrewed to the Zenith, is moved round the globe, that degree of it which anſwers to the ſun's altitude at the given time, will deſcribe a circle round the Zenith which is called his *Almacanther* for that inſtant.

PROB. XXIV. *The Latitude, Day of the Month, and Altitude of the Sun being given; to find the Hour of the Day, and the Sun's Azimuth?*

Rectify the globe for the given latitude, zenith, and ſun's place; and then turning the globe till the ſun's place is cut by that degree of the quadrant which ſpecifies the given altitude, and keeping the globe firm in that poſition, the index will point to the hour required; and that point of the Horizon which is then cut by the quadrant will ſhew the ſun's Azimuth.

In ſolving this problem, we are ſuppoſed to know whether the time required is in the forenoon or afternoon. If it is in the forenoon, we muſt bring the ſun's place, and the quadrant, to the eaſtern ſide of the Meridian; and to the weſtern, if the time is in the afternoon.

By finding the ſun's *Azimuth* in the manner here directed, we may correct the variation of the compaſs.

PROB. XXV. *The Latitude, Sun's Azimuth, and Day of the Month being given; to find the Hour of the Day?*

Rectify the globe for the given latitude, zenith, and ſun's place, and then bringing the quadrant to that point of the Horizon which ſpecifies the given Azimuth, and turning the globe till the ſun's place, for the given day, touches the graduated edge of the quadrant, the index will point to the hour required.

PROB. XXVI. *The Latitude, the Sun's Azimuth, and his Altitude being given; to find the Day of the Month, and the Hour of the Day, ſuppoſing they had both been loſt?*

Firſt rectify for the latitude, and zenith, and then fixing the Quadrant of Altitude to that point of the Horizon which anſwers to the given Azimuth, turn the globe round till ſome point of the Ecliptic cuts the quadrant in the given degree of altitude, and then, by referring that degree of the Ecliptic to the wooden Horizon, you will diſcover the day of the month required. This done (ſtill keeping the quadrant to the ſame point of the Horizon) bring the ſun's place thus found to the Meridian, and then ſetting the index to the upper XII, and afterwards bringing back the ſun's place to the graduated edge of the quadrant, the index will point to the hour required.

As the ſun, when in any two points of the Ecliptic which are equally diſtant from the firſt of *Cancer* and *Capricorn*, will have the ſame Altitude and Azimuth at the ſame hour, and as we cannot be ſuppoſed to be ignorant to what quarter of the year the required day belongs, we muſt conſtantly take that point of the Ecliptic which falls within the given quarter.

PROB. XXVII. *Any Latitude which is leſs than 66½ Degrees, and the Day of the Month being given; to find the Sun's Diurnal Arch?*

Find the length of the given day by Problem the 16th, and then reducing that length into degrees, by reckoning a degree for every four minutes, or dividing the whole number of minutes by 4, the quotient will be the *diurnal Arch* required; and the diurnal Arch ſubſtracted from 360 (the number of degrees in a circle) will give the *nocturnal Arch.*

Thus if the length of the given day is 14 hours and 30 minutes, the operation will ſtand as follows:

h. m.

14 : 30

60

4)870 minutes.

217.5 Degrees equal to the diurnal Arch required.

360° : 00′

217 : 30

142 : 30 the nocturnal Arch.

Prob. XXVIII. *The Day of the Month being given, to find the Sun's Right Aſcenſion; alſo, when the Day of the Month, and Latitude are given, to find the Sun's Oblique Aſcenſion and Deſcenſion, and the Aſcenſional Difference?*

Though this Problem may be ſolved upon the terreſtrial globe, yet, as it more properly belongs to the celeſtial, we ſhalldefer the ſolution of it till we come to the uſe of the latter.

Prob. XXIX. *The Latitude, and Day of the Month being given; to find the Hour of the Day by the Globe when the Sun ſhines?*

Place the globe where the ſun will ſhine upon it, ſo that the wooden Horizon may ſtand exactly level, and the brazen Meridian be due north and ſouth. Then rectifying for the latitude and ſun's place, and afterwards ſticking a ſharp needle into the latter, ſo that the needle may ſtand perpendicular to the ſurface of the globe, globe, turn the globe till the needle points ſo directly towards the ſun as to caſt no ſhadow: the index will then point to the hour required.

Table to exemplify the Solution of ſome of the following Problems.

Names of remarkable Stars.	Characters	Magnitud.	Rt. Aſc.		Declination.		
			°	deg.	°	min.	
Extremity of the Wing of Pegaſus, *Algenib*	γ	2	0	25	13	56	N.
In the Head of the Phœnix	α	2	3	46	43	32	S.
The bright Star in the Tail of the Whale	β	2	8	5	19	14	S.
In the Girdle of Andromeda	β	2	14	17	34	25	N.
The Spring of the River Eridanus, *Archenar*	α	1	22	20	58	23	S.

Names of the Stars.	Characters	Magnitud.	Rt. Aſc.		Declination.		
			o	deg.	o	min.	
In the Jaw of the Whale	α	2	42	38	3	11	N.
In the Head of Meduſa, *Algol*	β	2	43	15	40	4	N.
The bright Star of Perſeus	α	2	47	5	49	2	N.
The ſouth Eye of the Bull, *Aldebaran*	α	1	65	46	16	2	N.
The bright Star in the left Shoulder of Auriga, *Capella*	α	1	75	1	45	45	N.
The bright Foot of Orion, *Rigel*	β	1	75	49	8	28	S.
The North Horn of the Bull	β	2	77	51	28	24	N.
The Weſtern Shoulder of Orion	γ	2	78	16	6	8	N.
Bright Star in the Dove	α	2	82	53	34	13	S.
The Eaſtern Shoulder of Orion	α	1	85	45	7	21	N.
The bright Star in the Ship, Argo, *Canobus*	α	1	94	44	52	34	S.
The bright Star in the Dog's Mouth, *Sirius*	α	1	98	49	16	25	N.
In the Head of the Northern Twin, *Caſtor*	α	1	110	3	32	22	N.
The little Dog, *Procyon*	α	1	111	53	5	48	N.
In the Head of the Southern Twin, *Pollux*	β	1	112	53	28	34	N.
Bright Star in the Oars of the Ship Argo	β	1	137	40	68	47	S.
The Heart of the Female Hydra	α	2	139	8	7	42	S.

Names

Names of the Stars.	Characters	Magnitud.	Rt. Aſc.		Declination.		
			o deg.		o	min.	
The Lion's Heart, *Regulus*	α	1	149	5	13	3	N.
In the great Bear	α	2	162	25	62	58	N.
The Lion's Tail	β	2	174	24	15	50	N.
Foot of the Croſiers	α	1	183	34	61	51	S.
The Virgin's Pike	α	1	198	21	9	51	S.
The laſt Star in the Tail of the great Bear	η	2	204	40	50	27	N.
Weſt Foot of the Centaur	β	2	207	2	59	16	S.
Bright Star in Bootes, *Arcturus*	α	1	211	21	20	22	N.
Bright Star in the Eaſtern Foot of the Centaur	α	2	216	10	59	54	S.
Southern Scale of Libra	α	2	219	37	15	6	S.
Northern Scale of Libra	β	2	226	14	8	32	S.
Bright Star of the Crown	α	2	231	17	27	29	N.
Northernmoſt Star in Scorpion's Forehead	β	2	238	6	19	10	S.
Scorpion's Heart, *Antares*	α	1	243	54	25	54	S.
In the Eaſtern Knee of Ophieucus	η	2	254	23	15	26	S.
Head of Ophieucus	α	2	261	7	12	44	N.
Bright Star of the Harp, *Lyra*	α	1	277	20	38	35	N.
Bright Star of the Eagle, *Atair*	α	2	294	57	8	17	N.
Eye of the Peacock	α	2	301	56	57	26	S.
Tail of the Swan	α	2	308	26	44	29	N

Names of the Stars.	Characters	Magnitud.	Rt. Aſc.		Declination.		
			° deg.		°	min.	
Weſternmoſt Wing of the Crane	α	2	328	30	48	2	S.
In the Southern Fiſh, *Fomalhaut*	α	1	341	17	30	49	S.
In the Shoulders of Pegaſus	ϐ	2	343	13	26	52	N.
In the Wing of Pegaſus, *Markab*	α	1	343	23	14	00	N.
The Head of Andromeda.	α	2	359	12	27	50	N.

PROBLEMS to be ſolved on the Celeſtial Globe.

Prob. I. *To find the Right Aſcenſion of the Sun, or any fixed Star?*

Bring the ſun's place, or the given ſtar, to the graduated edge of the Meridian, and that degree on the Equinoctial which is then cut by the Meridian is the right aſcenſion required.

It is evident from hence that to find the ſun's right aſcenſion, the day of the month muſt be given.

Prob. II. *To find the Declination of any given Star?*

Bring the given ſtar to the brazen Meridian, and that degree of the Meridian, which is then directly over the given ſtar, will be its declination, either *north* or *ſouth*.

Prob. III. *The Right Aſcenſion and Declination of any Star being given; to find that Star on the Celeſtial Globe?*

Bring that degree on the Equinoctial which anſwers to the given right aſcenſion to the graduated edge of the Meridian; and then, under that degree of the Meridian which ſpecifies the given declination, (whether *north* or *ſouth*) you will find the ſtar required.

It is evident from hence, that the method of finding any ſtar on the celeſtial globe, by its right aſcenſion and declination, is exactly ſimilar to that of finding any place on the terreſtrial globe by its latitude and longitude.

Prob. IV. *The Latitude, and Day of the Month being given; to find the oblique Aſcenſion of the Sun or any Star, and the Aſcenſional Difference?*

Rectify for the given latitude, and then bringing the ſun's place, or the given ſtar, to the eaſtern edge of the Horizon, that degree of the equinoctial which is then cut by the Horizon will be the oblique aſcenſion required.

The difference between the *right* and the *oblique* aſcenſion is called the *aſcenſional difference:* and that difference converted into time, by reckoning four minutes to a degree, will ſhew how long the ſun riſes before or after ſix o'clock in the morning.

Prob. V. *To find the Latitude and Longitude of any given Star?*

Rectify the globe for 66½ degrees, either north or ſouth latitude (according to which ſide of the Ecliptic the given ſtar is poſited on) and then bringing the correſponding pole of the Ecliptic to the zenith or graduated edge of the Meridian, and rectifying for the zenith, move the quadrant till its graduated edge paſſes through the center of the given ſtar: then the degree of the quadrant which lies directly over the ſtar will be its *Latitude*, and that ſign and degree of the Ecliptic which is cut by the quadrant will be its *Longitude*.

It is eaſy to conceive from hence how any ſtar may be found on the celeſtial Globe, when its Latitude and Longitude are given.

PROB. VI. *To find the Diſtance of one given Star from another in an Arch of a great Circle?*

Bring one of the given ſtars to the graduated edge of the Meridian, and then ſcrewing the quadrant directly over it, and afterwards moving it till its graduated edge cuts the other ſtar; the number of intermediate degrees on the quadrant, between the two ſtars, will be the required diſtance between them.

PROB. VII. *The Latitude of any Place, and the Day and Hour being given; to repreſent the Face of the ſtarry Heavens, as ſeen from that Place at the given Time?*

Rectify the globe for the given latitude and ſun's place, and then turning it on its axis, till the index points to the given hour, that half of the globe which is above the Horizon will repreſent the hemiſphere of the ſtarry heavens, which is viſible at the given place and time.

If you likewiſe rectify for the Zenith, you may eaſily diſcover the conſtellations and remarkable ſtars then viſible in the heavens, by finding their reſpective Altitudes, and Azimuths, by the quadrant, in the ſame manner as you was directed to find thoſe of the ſun in Problem the 23d. of the preceeding chapter.

When you have the face of the heavens thus repreſented on the globe for any given time, all thoſe ſtars which lie along the eaſtern edge of the Horizon are then riſing; all thoſe along the weſtern edge are ſetting; and all thoſe along the Meridian, between the N. pole and the ſouthern point of the Horizon (if the latitude be north) are *culminating*, or at their greateſt height.

Prob. VIII. *The Latitude and Day being given, to find the Time when any known Star will riſe, culminate, or ſet?*

Rectify the globe for the latitude and ſun's place; then bring the given ſtar to the eaſtern edge of the Horizon, and the index will ſhew the time of its *riſing*; bring it to the brazen Meridian, and the index will ſhew the time of its *culminating*; and laſtly, bring it to the weſtern edge of the Horizon, and the index will ſhew the time of its *ſetting*.*

The ancients frequently mention the ſtars riſing and ſetting *coſmically*, *achronically*, and *heliacally*. A ſtar is ſaid to riſe r ſet *coſmically*, when it riſes or ſets at *ſun-riſing*; and *achronically*, when it riſes or ſets at *ſun-ſetting*. If therefore any given ſtar is brought firſt to the eaſtern, and afterwards to the weſtern edge of the Horizon (the globe being previouſly rectified for the latitude of any given place) thoſe two points of the Ecliptic, which are then ſucceſſively cut by the eaſtern edge of the Horizon, will determine the two days of the year on which the given ſtar riſes or ſets *coſmically*; and thoſe two points of the Ecliptic which are ſucceſſively cut by the weſtern edge of the Horizon, will determine the two days on which the given ſtar riſes or ſets *achronically*. A ſtar is ſaid to *riſe heliacally* when it firſt becomes viſible in the eaſt, after having been ſo near the ſun as to be hid by the ſplendor of his rays; from whence it is evident, that it muſt then riſe a little before the ſun. A ſtar is ſaid to *ſet heliacally*, when it firſt comes ſo near the ſun as to be hid by his rays, though it does not ſet till he is ſome degrees below the Horizon in the evening. Stars of the firſt magnitude are viſible at their riſing and ſetting, when the ſun is 12 degrees below the Horizon; thoſe of the 2d, not till he is 13 degrees below it; and ſo on, adding one degree to the ſun's depreſſion below the Horizon, for every leſſer degree of magnitude.

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* It will be very eaſy, by this Problem, to determine the time of any ſtar's continuance above the Horizon.

The *Dies Caniculares*, or *Dog-days*, are a certain number of days, part of them preceeding, and part following the heliacal riſing of *Sirius*, the dog-ſtar. They commence at the latter end of July, and end about the beginning of September. It was anciently believed that the ſultry heat, during that part of the year, was owing to the combined rays of the dog-ſtar and the ſun, as they moved through the heavens together. The Romans, therefore, ſacrificed a brown dog to *Sirius* every year, at the time of his heliacal riſing, to appeaſe his wrath.

PROB. IX. *To find on what Day of the Year a given Star will culminate (or be upon the Meridian) at a given Hour of the Night?*

Bring the given ſtar to the brazen Meridian, and ſet the index to the given hour; then turning the globe till the index points to the upper XII, the Meridian will cut that degree of the Ecliptic which anſwers to the day required.

PROB. X. *The Latitude of any Place in the northern Hemiſphere being given; to find what Stars never riſe or ſet to that Place?*

Rectify for the given latitude, and obſerve what degree of the brazen Meridian is cut by the ſouthern point of the Horizon: then, all thoſe ſtars which have more north declination than anſwers to that degree of the Meridian, never ſet to the given place, and thoſe which have more ſouth declination never riſe.

It may eaſily be underſtood from hence, how to find what ſtars never riſe or ſet in any given ſouthern latitude.

PROB. XI. *The Latitude, Day, and Hour being given, to find the Altitude and Azimuth of any given Star?*

Rectify for the latitude, ſun's place, and zenith; and then turning the globe till the index points to the given hour, and laying the graduated edge of the quadrant over the given ſtar, its required *Altitude* will be the degree of the quadrant which lies directly over it, and its *Azimuth* that point of the Horizon which is cut by the edge of the quadrant.

PROB. XII. *The Latitude, Day of the Month, and Azimuth of any known Star being given; to find the Hour of the Night?*

Rectify for the latitude, Zenith, and ſun's place, and lay the quadrant to the given degree of Azimuth; then turning the globe till the given ſtar comes to the graduated edge of the quadrant, the index will point to the required hour of the night.

PROB. XIII. *The Latitude, Day of the Month, and Altitude of any known Star being given; to find the Hour of the Night?*

Rectify for the latitude, zenith, and ſun's place, and then bringing the quadrant and given ſtar to that ſide of the meridian on which the ſtar is ſuppoſed to be, turn the globe and the quadrant together, either backwards or forwards, till the given degree of altitude on the quadrant lies directly over the center of the given ſtar: the index will then point to the required hour of the night.

N. B. You may find the altitude of any known ſtar, when viſible in the heavens, by a common Gunter's quadrant.

PROB. XIV. *To find the Time of the Night by two known Stars, then viſible in the Heavens, without knowing either their Altitude or Azimuth?*

Suſpend a line and plummet in your hand, and move it gently round betwixt your eye and the ſtarry heavens, till any two known ſtars are exactly cut by the line at the ſame inſtant. Then rectifying the globe for the latitude, zenith, and ſun's place, and afterwards turning it till the index points to the time of the night as nearly as you can gueſs it, lay the graduated edge of the quadrant over one of the two ſtars which were cut by the line. If the quadrant likewiſe cuts the other ſtar, you have gueſſed the time exactly;

but if it does not happen to cut them both, (as will moſt probably be the caſe) turn the globe and quadrant together till it does, and the index will then point to the hour required.

Prob. XV. *To find the place of the Moon, or of any Planet, on the celeſtial Globe, on any given Day of the Year; and thereby to diſcover the Time of its riſing, culminating, or ſetting, on the given Day, to any Place whoſe Latitude is given?*

Look in *Parker's*, *White's*, or the *Royal Ephemeris*, for the latitude and longitude of the planet on the given day, and then finding its place on the celeſtial globe, by Problem the 5th of this chapter, put a patch or chalk-mark on the globe to repreſent it. This done, you may eaſily find the times of its riſing, culminating, and ſetting, in the ſame manner as you have been directed for any given ſtar in Problem the 8th. It will likewiſe be equally eaſy to find the planet's Altitude and Azimuth, at any given hour of the night.

As the moon moves through about 13 $\frac{1}{6}$ degrees of the Ecliptic in 24 hours, or about half a degree in an hour, it will be neceſſary, for greater exactneſs, to add half a degree to her longitude, as ſpecified in the Ephemeris, for every intermediate hour between the given time and the preceeding noon: becauſe the longitudes of the planets, in the Ephemeris, are calculated for the noon of that day to which they reſpectively correſpond. The places of the planets, as ſpecified in the Ephemeris, are their *geocentric* places; *i. e.* their places as they are ſeen from the earth.

PARA-

PARADOXES.

AS it is uſual to ſubjoin a few Paradoxes to the Problems to exerciſe the learner's capacity, I beg leave to preſent him with the following, and ſhall leave the ſolution of them to his own ſagacity, or to that of his teacher.

Par. 1. There is a place on the earth, of a conſiderable ſouthern latitude, which has both the greateſt and leaſt degree of longitude.

Par. 2. There is a place on the earth, where the wind conſtantly blows from the north; and, what is ſtill more ſurprizing, there is another place where the ſun is always full ſouth, and where it is conſtantly noon for a conſiderable number of days together.

Par. 3. There are two harbours (which, for diſtinction ſake, we will call A and B,) ſo ſtrangely ſituated, that though B lies directly eaſt from A, a ſhip may arrive at B by ſailing weſt from A during the whole voyage.

Par. 4. There are two places which are exactly 60 leagues diſtant from each other; and yet a ſhip, which ſails from one of thoſe places, muſt ſteer 30 leagues full north, and 30 full ſouth, to keep the direct courſe to the other place.

Par. 5. There are two places, A and B, ſo ſituated, that though B lies directly eaſt from A, A does not lie directly weſt from B.

Par. 6. There is a village in the kingdom of Naples, ſituated in a deep valley; and yet the ſun is nearer to the inhabitants thereof every noon, 3000 miles and upwards, than at his riſing and ſetting.

To ſolve this Paradox, it will be neceſſary to obſerve that the ſemidiameter of the earth is almoſt 4000 miles in length.

Par. 7. It is poſſible for two perſons to be paſſengers in the ſame ſhip, during the ſame voyage, and yet one of them ſhall ſail more leagues than the other.

Par. 8. It is poſſible that of two perſons who were born at the ſame place, and at the ſame inſtant, and who likewiſe both died on the ſame day, and the ſame hour of the day, the one of them at his death may be ſeveral days, nay ſeveral weeks older than the other.

To render this Paradox intelligible, it will be neceſſary to obſerve, that if a ſhip ſets out from any port, and ſails round the earth eaſtward till ſhe returns to the ſame port again, (whatever time ſhe may take to do it in) the people on board, in reckoning their time, will have gained one compleat day at their return, more than thoſe who live at the given port. If the ſhip ſails weſtward, they will have loſt a day: and, conſequently, if two ſhips ſhould ſet out at the ſame time from the ſame port, one eaſtward, and the other weſtward, and ſail round the earth in that direction, ſo as both to return to the ſame port on the ſame day, they will differ two days in their reckoning at the time of their return.

Par. 9. There are two places on the earth, in which there is only one day and one night throughout the year.

Par. 10. There are two places on the earth, in which it is neither day nor night for 24 hours.

Par. 11. There is a place on the earth, where the ſun, moon, and all the planets actually riſe and ſet according to their reſpective motions, but the ſtars never riſe nor ſet there in the whole year.

Par. 12. There is an extenſive country in Ethiopia Superior, where the moon commonly appears to be moſt enlightened when ſhe is leaſt ſo, and *vice verſâ*.

It may here be proper to hint that the moon is leaſt enlightened, in reality, when ſhe is fartheſt from the ſun.

Par. 13. There are certain places where, at a certain time of the year, the ſun comes twice to the ſame azimuth, or point of the compaſs, in the forenoon after his riſing, and twice to the ſame point of the compaſs in the afternoon before he ſets.

To ſolve this Paradox, rectify the globe for Barbadoes, and fixing the quadrant 18 degrees N. from the eaſt point of the Horizon, make a chalk mark in the ſun's place, which may be any where between the middle of *Taurus*, and the middle of *Leo*.

Par. 14. There is a place on the earth, where the ſun, on the 21ſt of December, is full north at our 6 and 8 o'clock in the morning, at our noon, and at our 1, 3, 5, and 7 o'clock in the afternoon.

Par. 15. There is an African iſland, in which, on ſeveral days of the year, the ſun is full north to one part of the inhabitants, and full ſouth to the other part at the ſame hour and minute of the day.

N. B. This laſt Paradox is new.

Par. 16. There is a noted place on the earth, wherein the ſun and the moon, even when at the full, and conſequently in oppoſite parts of the Ecliptic, may both happen to riſe at the ſame time, and upon the ſame point of the compaſs.

Par. 17. There are two particular places on the earth, which differ 60 degrees in longitude, and yet are only 30 miles diſtant from each other.

Par. 18. There are two places on the earth, whoſe difference of longitude is 340 degrees, and yet they are only 20 degrees aſunder.

Par. 19. There is a place on the earth, where the ſun, and all the planets, conſtantly riſe and ſet in the ſouth.

Par. 20. There is a place under the Meridian of London, where the ſun is due eaſt at a quarter of an hour before 12, twice every year.

Par. 21. There are 5 places on the earth, 4 of which, though they all differ from each other both in latitude and longitude, lie directly ſouth from the 5th.

The Principles and Method of conſtructing DIALS, by the common Terreſtrial GLOBE.

A *Dial* is a plane ſo poſited, and upon which lines are deſcribed in ſuch a manner, that the ſhadow of a wire, or of the upper edge of a thin plate, properly erected upon the plane, may ſhew the true hour of the day when the ſun ſhines.

That edge of the plate or gnomon, by the ſhadow of which the time of the day is found, (*i. e.* the upper edge) is called the *ſtile* of the dial, and muſt always be parallel to the axis of the earth, one half of which it is intended to repreſent.

As the plate of the gnomon is always erected perpendicularly upon the plane of the dial, that line upon which the plate is erected, being directly under the *ſtile* of the dial, is called the *ſub-ſtile:* and the angle between the *ſtile* and *ſub-ſtile* is called the *elevation* or height of the ſtile.

The plane of every dial is ſuppoſed to repreſent the plane of ſome great circle on the celeſtial globe, and muſt therefore always be placed parallel to it, or in the ſame direction.

Thoſe dials, whoſe planes are parallel to the plane of the horizon of the place for which they are conſtructed, are called *horizontal dials:* thoſe dials whoſe planes are perpendicular to the plane of the Horizon, or in the ſame direction as the plane of any *vertical* circle, are called *erect* or *vertical* dials: and thoſe dials, whoſe planes are parallel to the plane of the Equator, are called *equinoctial* dials.

Thoſe vertical dials, whoſe planes directly front the ſouth, are called *direct ſouth dials:* and thoſe which front it obliquely are called *ſouth decliners.*

If the plane of a dial (as is ſometimes the caſe,) is neither parallel to the plane of the Horizon, nor perpendicular to it, it is then called an *inclining*

4

clining, or a *reclining* dial, according as the plane of it makes an acute, or an obtuſe angle with that of the Horizon: and if ſuch a dial likewiſe declines from the ſouth, it is called a *declining-inclining*, or a *declining-reclining* dial.

That line in which the plane of the dial is interſected by the plane of the meridian of any given place, is called the *meridian line* of the dial, or the hour line of XII or mid-day.

The interſection of the planes of the other meridians, or hour-circles, with the plane of the dial, form the remaining hour-lines.

In every declining dial, the ſub-ſtile makes an angle with the meridian-line; which angle is ſometimes called the diſtance of the ſub-ſtile from the meridian, and ſometimes the declining plane's difference of longitude.

To render the principles of dialing as evident as poſſible, it would not be amiſs to be provided with a wire ſphere conſtructed as follows. Join together at the two poles, or extremities of a wire axis, 24 wire ſemicircles, ſo that each of them may be 15 degrees diſtant from that which is neareſt to it on either ſide. Theſe wire ſemicircles will then repreſent the 24 meridians, or hour-circles on the globe: but thoſe two of them which are intended to repreſent the hour-circles for XII at noon, and XII at midnight, ſhould be larger than the reſt, and beaten flat, ſo as to reſemble a common brazen meridian; or rather let an old brazen meridian (which may be eaſily procured) ſupply their place. This done, fix the ſphere in a wooden frame with a ſtand, reſembling the horizon and ſtand of an artificial globe; and put within the ſphere a thin circular plate of braſs, or wood, which exactly fits it, ſo as to be moved any way at pleaſure about the center of the ſphere's axis.

If you rectify this ſphere for the latitude of any place, (as ſuppoſe of London) and move the circular plate till it coincides with the plane of the wooden frame, repreſenting the Horizon; then the plate within the ſphere will be the *plane* of a *horizontal* dial for London; the northern half of the axis will be its *ſtile* properly elevated; and right lines drawn upon the plate, from the center of the axis to thoſe points of the plate's circumference which are interſected by the northern part of the brazen meridian, and the 8 neareſt hour-circles on each ſide of it, will be the *hour lines*. But it muſt be remembered that the *meridian*, or 12 o'clock line, is that which is drawn from the center of the plate to the north point of the wooden frame, which repreſents the Horizon; and that the forenoon hour-lines are thoſe on the weſtern ſide of the meridian line, and the afternoon hours thoſe on the eaſtern ſide. If the ſphere thus prepared is placed in the ſun-ſhine at any given hour, ſo as to ſtand due north and ſouth, with the circular plate in a horizontal poſition, the ſhadow of the northern half of the axis will fall exactly upon that hour-line, and its reſpective hour-circle, which correſponds with the given hour.

If you rectify the ſphere for the given latitude, and move the circular plate till it ſtands erect, and coincides with the plane of the prime vertical directly facing the meridian of the place; the plate will then become the plane of a *vertical direct ſouth dial*, the lower half of the axis will be the *ſtile* of the dial, and lines drawn from the center of the plate to thoſe points of its circumference which are interſected by the lower hour-circles of the ſphere will be the *hour-lines* of the dial.

If the plate within the ſphere thus rectified be made either to *decline*, *incline*, or *recline* any given number of degrees leſs than 90, the hour-circles of the ſphere will ſtill interſect the circumference of the plate in thoſe points to which the hour-lines ſhould be drawn from its center, and the axis of the ſphere will caſt a ſhadow on thoſe hour-lines at the correſponding hours of the day. But if the plate within the ſphere be moved till it coincides exactly with the plane of the Equator, the ſun, while he continues in the ſouthern or winter half of the Ecliptic, will conſtantly ſhine on the bottom of the plate; and while he continues in the northern or ſummer half of the Ecliptic, he will conſtantly ſhine on the upper ſide of the plate: alſo thoſe points of the plate's circumference which are cut by the hour-circles will all be at equal diſtances from each other, and the upper half of the axis will be the *ſtile* of the dial in the ſummer, and the lower half in winter.

The reſult of what has been ſaid is, that the *plane* of every dial is parallel to, or in the ſame direction as the plane of ſome great circle upon the earth, and that the *ſtile* of every true dial is parallel to the earth's axis. The reaſon is, becauſe the bulk of the whole earth is but a point, if compared with the diſtance of the ſun; ſo that if a wire-ſphere, conſtructed as above, be placed any where upon the earth's ſurface, and the axis of that and the earth be kept parallel to each other, the ſphere will ſhew the ſame viſible time there, as if it were placed in the center of the earth, and the ſhell or body of the earth were as tranſparent as glaſs.

From what has been premiſed, it will not be difficult to underſtand the principles upon which the following problems are ſolved for the conſtruction of dials.

PROBLEM I.

To conſtruct a horizontal Dial by the terreſtrial Globe, for any given Latitude; (as ſuppoſe for that of London.)

Elevate the pole to the given latitude, (as for example to 51 ½ degrees N.) and bringing the vernal colure, or any one of the meridians, to the northern point of the Horizon, ſet the index to the upper XII, and turn the globe weſtward, till 15 degrees of the Equator paſs under the brazen meridian; the index will then point to I, and the vernal colure will cut the Horizon ſo many degrees from the N. point, as the I o'clock line for the afternoon ought to be diſtant from the XII o'clock or meridian line upon the dial. Turn the globe ſtill farther weſtward, till 15 degrees more of the Equator paſs under the brazen meridian, and the index will then point to II, and the vernal colure will cut the Horizon as many degrees from the N. point, as the 2 o'clock line ought to be diſtant from the meridian line. In the ſame manner you may find all the other hour lines, by turning the globe farther eaſtward, ſo that 15 degrees of the Equator may paſs under the meridian for every ſucceeding hour. To ſave trouble, it will be proper to remark that the diſtances of XI, X, IX, VIII, VII, and VI in the forenoon, are the ſame from XII, or the meridian line, as the diſtances of I, II, III, IV, V, and VI in the afternoon; and that the above hour-lines, produced through the center, will give the oppoſite hour-lines on the other half of the dial. But as the ſun never riſes with us much ſooner than IV in the morning, nor ſets much later than VIII in the evening, the intermediate nocturnal hour-lines need not be expreſſed on the dial.

From what has been ſaid it will be eaſy to underſtand that the quarter and half hour-lines, if required, may readily be found, by cauſing the Equator to paſs a proportional number of degrees under the brazen meridian.

To deſcribe the hour-lines as above upon paper, or upon any plane which is intended for a horizontal dial, draw two parallel right lines for the meridian, or 12 o'clock line, as far from each other as is equal to the intended thickneſs of the ſtile-plate; and draw another right line acroſs the meridian line at right angles, for the hour-line of VI in the morning and evening. Then from the two points of interſection, as centers (the one on one ſide of the meridian line, and the other on the other ſide) deſcribe two quadrants or quarters of a circle, between the meridian and 6 o'clock line, with any convenient opening of the compaſſes. This done, take a common protracter, or a ſcale of chords, and beginning from the meridian, ſet off in degrees on each ſide of the meridian the ſeveral diſtances which have been found as above for determining the hour-lines. Theſe diſtances, if accurately taken, will be as follows for the latitude of London; viz. for I o'clock in the afternoon, $11\frac{2}{3}$ degrees, for II, $24\frac{1}{2}$, for III, $38\frac{1}{12}$, for IV, $53\frac{1}{2}$, and for V, $71\frac{1}{12}$. The ſame diſtances, as we have already obſerved, are likewiſe to be taken for the forenoon hours.

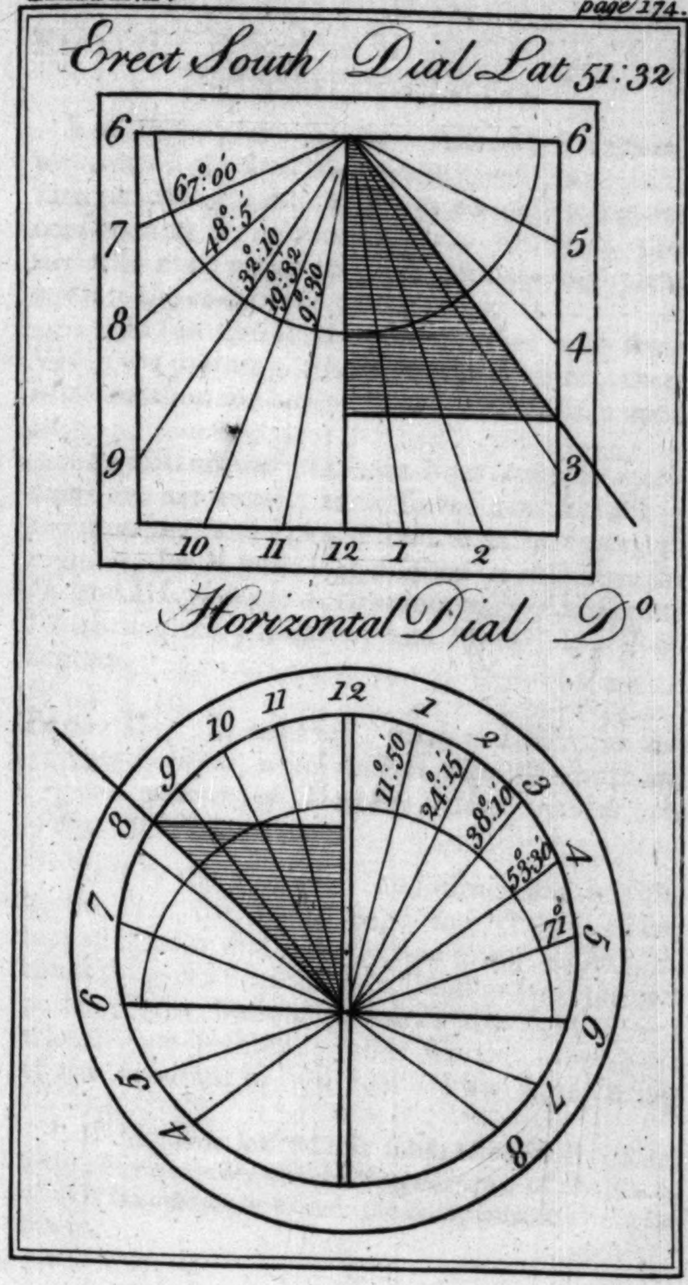
As the hour-lines are leſs diſtant from each other the nearer they approach to the meridian line, it will be convenient to take the centers of the quadrants above-mentioned a little below the center of the dial plane, on the ſide oppoſite to the XII at noon. This will bring the figures which repreſent the hours to a more equal diſtance, if they are placed along the circumference of a circle deſcribed round the center of the dial plane.

Laſtly, if from the center of either quadrant, and on the ſame ſide of the meridian line, you draw a right line ſo as to form an angle with the meridian equal to the latitude of the place, and from that line let fall a perpendicular upon the meridian line a little below the ſouth point, you will have a triangle which will give the ſuperficial dimenſions of the ſtile-plate for your intended dial: for, as we have before obſerved, the elevation of the ſtile above the plane of the dial ſhould always be equal to the elevation of the pole above the horizon of the given place.

To render what we have ſaid more intelligible, I have annexed the figure of a horizontal dial conſtructed for the latitude of London. Vide Plate IV.

PROB.

PLATE. IV. page 174.


Erect South Dial Lat 51:32

Horizontal Dial D^o

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PROB. II. *To conſtruct a vertical direct South Dial for any given Latitude.*

Rectify the globe for the *co-latitude*,* or complement of the latitude of the given place; and then proceed in all reſpects as above directed for conſtructing a horizontal dial, obſerving that the ſtile muſt make an angle with the dial plane equal to the *co-latitude* of the place.

As the ſun can ſhine upon this dial only from VI in the morning till ſix in the evening, there is no occaſion for having above twelve hours upon it.

The diſtances of the hour-lines from the meridian-line are nearly as follows; viz. for XI in the morning, and I in the afternoon, 9 degrees 30 minutes, for X and II 19 degrees 32 minutes, for IX and III 32 degrees 10 minutes, for VIII and IV 48 degrees 5 minutes, and for VII and V 67 degrees.

PROB. III. *To conſtruct a vertical Dial, for any given Latitude, which declines from the South any given number of Degrees, either towards the Eaſt or Weſt.*

Rectify the globe for the latitude and zenith, by problem the 13th, page the 56th. Then, ſuppoſing your dial is to decline towards the eaſt, count the given degrees of declination from the eaſt point of the horizon towards the north, and where your reckoning ends fix the lower part of the quadrant of altitude. This done, bring the vernal colure to the graduated edge of th brazen meridian, and ſetting the index to the upper XII turn the globe eaſtward, and obſerving the number of degrees on the quadrant (counting from the zenith) which are ſucceſſively cut by the vernal colure as the index points to XI, X, IX, VIII, VII, &c. or as 15, 30, 45, 60, &c. degrees of the Equator paſs under the brazen meridian, thoſe degrees on the quadrant will be the reſpective angular diſtances of the forenoon hours from the XII, or meridian line, on the plane of the dial.

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* If the given latitude is ſubſtracted from 90 degrees, the remainder will be the *co-latitude* of the place, or as it is commonly called the complement of the latitude.

For the afternoon hours, bring the quadrant of altitude to the part of the horizon directly oppoſite to that to which you had fixed it before; and then bringing the vernal colure to the graduated edge of the meridian, and turning the globe weſtward, proceed in all reſpects in the ſame manner as when you found the forenoon hours. It is almoſt unneceſſary to obſerve, that when the vernal colure comes to the bottom of the quadrant at the horizon, either in the forenoon or afternoon, the index will point to the hour when the ſun firſt comes upon the dial in the morning, and when it leaves it in the evening.

If your dial is to decline weſtward from the ſouth, count the given degrees of declination from the eaſt point of the horizon towards the ſouth point, and then fixing the quadrant of altitude to that point of the horizon where your reckoning ends, proceed in all reſpects as above directed for conſtructing a dial which declines towards the eaſt.

To find the diſtance of the *ſub-ſtile* from the 12 o'clock or meridian line, in either caſe, fix the quadrant of altitude to that point of the horizon which anſwers to the given declination, as above directed for finding the hour-lines; then turn the globe, till the vernal colure cuts the horizon at as many degrees, from the ſouth point towards the eaſt, as are equal to the given declination. This done, the number of degrees on the quadrant which are then intercepted between the vernal colure and the zenith will give the angular diſtance of the ſub-ſtile from the 12 o'clock line; and the number of degrees which are intercepted between the N. pole, and that point of the vernal colure which is cut by the quadrant (and which may be eaſily found by bringing the vernal colure to the graduated edge of the brazen meridian) will give the elevation of the ſtile above the plane of the dial.

PROB. IV. *To conſtruct an equinoctial Dial.*

The plane of this dial muſt be parallel to the plane of the Equator, and, conſequently, it's elevation above the plane of the horizon muſt be equal to the co-latitude of the place; the hour-lines muſt all be at equal diſtances from each other, and drawn, both on the upper and lower ſides of the dial plane, ſo as to form a kind of double dial; and the ſtile muſt be a long needle, or piece of wire, perpendicular to the dial plane, and thruſt quite through it, ſo that the upper half of the needle may ſerve as a ſtile to the uppermoſt face of the dial, and the lower half to the bottom or undermoſt face. We have already obſerved that during the ſummer half-year the ſun will conſtantly ſhine on the uppermoſt face, or top of ſuch a dial, and during the winter half-year on the lower face.

As it may be uſeful, in fixing horizontal dials, to know how to find the true meridian, of any place, without the aſſiſtance of a mariner s compaſs, or nautical box; I beg leave to preſent the reader with the following rule for that purpoſe, which if carefully obſerved will be found to anſwer very exactly.

Deſcribe four or five concentric circles, about a quarter of an inch aſunder, upon a flat board about a foot ſquare, ſo that the outermoſt circle may almoſt touch the edge of the board. Fix perpendicularly in the center, a pin about the eighth of an inch thick, with a round blunt point, and of ſuch a length that it's whole ſhadow may fall within the innermoſt circle, for at leaſt 3 or 4 hours in the middle of the day. The board being thus prepared, fix it exactly level, in a place where the Sun ſhines from 7 or 8 o'clock in the morning till 4 or 5 in the afternoon, at which hours the end of the ſhadow ſhould fall without all the circles. Then carefully obſerve the times in the forenoon when the end of the ſhadow, while it continues to ſhorten, juſt touches the ſeveral circles, and mark the points where it does ſo; and in the afternoon watch the lengthening ſhadow in the ſame manner, and make marks, as before, where it's extremity touches the circles; this done, take a pair of compaſſes, and find exactly the middle point between the two marks on any one of the circles; and then drawing a right line from their common center through that point, you will have the true meridian line required.

The reaſon for drawing ſeveral circles is, that if the Sun ſhould be clouded, either in the forenoon or afternoon, when the end of the ſhadow would have touched one of the circles, you may have a chance of ſeeing it when it touches another of the circles. It muſt likewiſe be remarked, that the moſt convenient time for finding the true meridian of any place in this manner, is about the Summer-Solſtice ; becauſe then the Sun's declination changes ſloweſt, and his altitude faſteſt.

Of the CONSTRUCTION *and* USE *of* MAPS.

A Map is a plane figure, repreſenting the ſurface of the earth, or of any part thereof, with the relative ſituation of it's ſeveral cities, remarkable mountains, rivers, foreſts, &c.

Thoſe maps which exhibit a plan of the whole ſurface of the earth are called *general* or *univerſal maps*, but thoſe which repreſent only ſome particular part of it's ſurface are called *particular* ones. Both kinds are likewiſe called *geographical* or *land-maps*, to diſtinguiſh them from *hydrographical* or *ſea-maps*, which repreſent the ſeas and ſea-coaſts, and are properly called *charts*.

The ancients repreſented all the parts of the then known world in one general map ; and as thoſe parts extended conſiderably further from eaſt to weſt than from north to ſouth, the diſtance or length from eaſt to weſt, or *vice verſâ*, was called *longitude*, and that from north to ſouth was called *latitude*.

The modern *general* maps give us a view of one entire hemiſphere of the terreſtrial globe, and are projected either upon the plane of the *Equator*, or that of the *Meridian*, or that of the *Horizon* ; one or another of which circles bounds the map, or projected hemiſphere.

The projection of any hemiſphere for conſtructing a general map is either *ſtereographic*, or *orthographic*.

In the *ſtereographic* projection, the eye of the obſerver is ſuppoſed to be placed in ſome point of the ſurface of the globe, and from thence (as if the globe was as tranſparent as a ſhell of thin glaſs) to behold the concave ſide of the oppoſite hemiſphere with all its reſpective meridians, parallels, &c. upon it as they are deſcribed upon the artificial globe; but the parts about the middle of the hemiſphere thus projected muſt neceſſarily be a little contracted, ſo as to be too ſmall in proportion to the magnitude of the extreme or outermoſt parts. This projection is either *equatoreal*, *meridional*, or *horizontal**.

In the *equatoreal* projection, the eye is ſuppoſed to be placed in one of the poles of the earth, and from thence to view the oppoſite concave hemiſphere, with it's circles, projected upon a plane of glaſs which paſſes through the Equator; it is therefore evident, that when the hemiſphere is thus projected the correſponding pole muſt be in the center of the map.

In a *meridional* projection, the eye of the obſerver is ſuppoſed to be placed in ſome point of the Equator, and from thence to view the oppoſite concave hemiſphere, as above, upon a plane of glaſs, paſſing through one of the meridians. Maps of this kind are uſually projected upon the plane of the meridian which paſſes through one of the Canary Iſlands, called *Ferro*; becauſe, by taking this meridian, one hemiſphere will contain *Europe*, *Africa*, and *Aſia*, and the other North and South *America*.

In a *horizontal* projection, the eye of the obſerver is ſuppoſed to be placed in the antipodes

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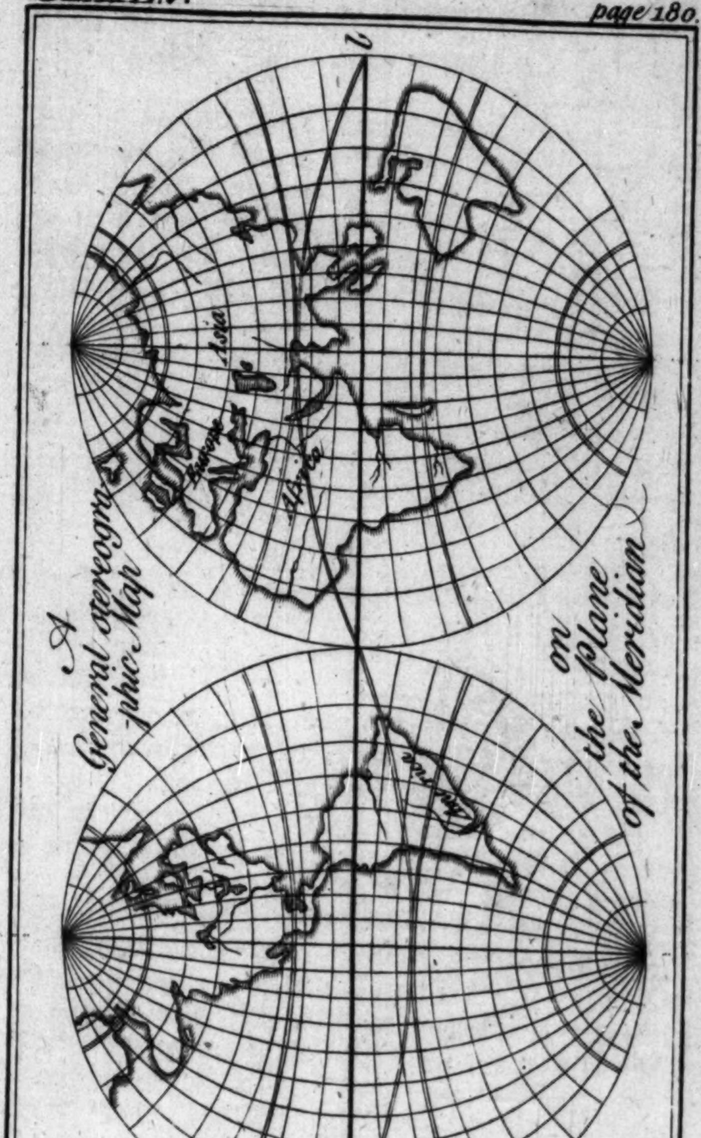
* Vid. Plates V, VI, VII.

PLATE. V.

page 180.



A General Stereographic Map on the Plane of the Meridian

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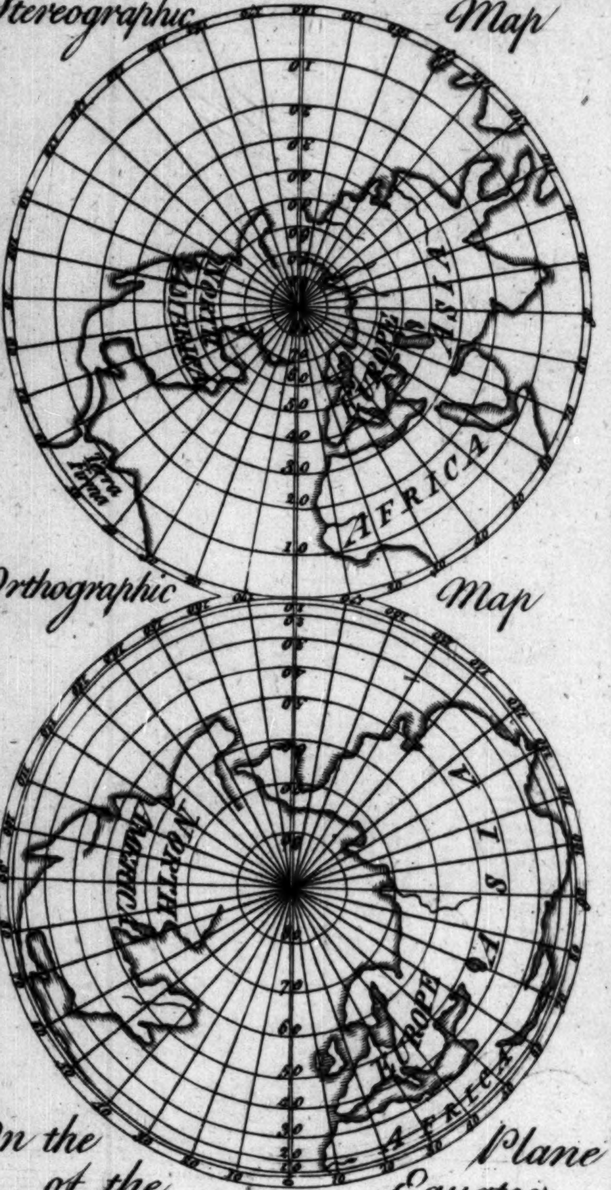
PLATE.VI.

page 180.

Stereographic Map

Orthographic Map



On the Plane of the Equator

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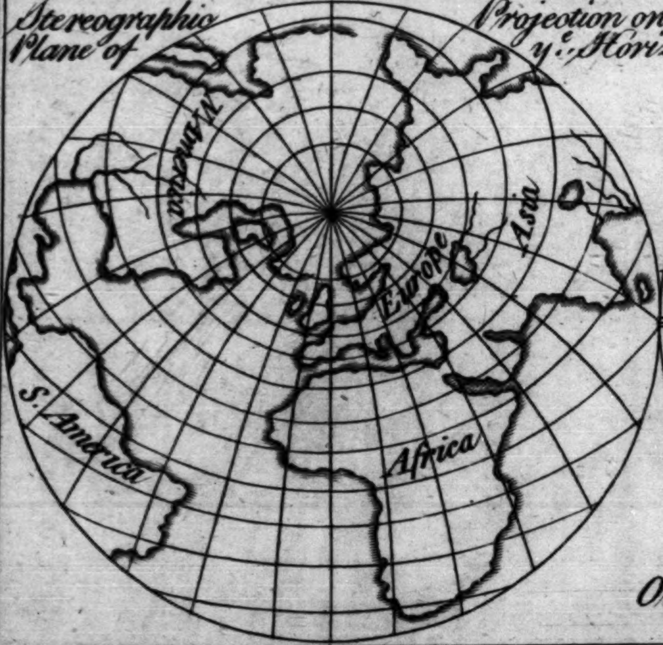
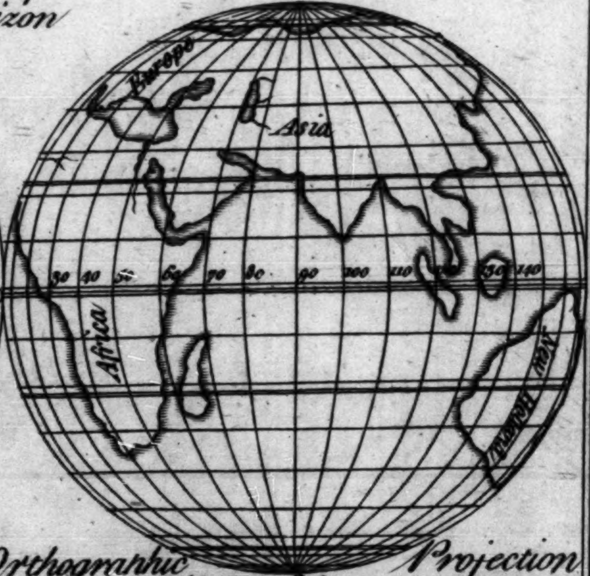


Stereographic Projection on ye
Plane of ye Horizon



Orthographic Projection
upon ye Plane of ye Meridian

tipodes of the place upon the horizon of which the projection is to be made, and from thence to view the oppoſite concave hemiſphere, as before, on a plane of glaſs which paſſes through the horizon of the given place. It is evident that there may be an infinite variety in this ſort of projection.

If the eye be ſuppoſed to view the given hemiſphere at a very great diſtance, either on it's convex or concave ſide, the projection, on the plane of whatever circle it is made, is ſaid to be *orthographic*. In this projection the parts about the middle are very diſtinctly exhibited, but the extreme parts are very much contracted; i. e. for inſtance, ſuppoſing the projection to be *equatoreal*, the parallels of latitude near the Equator will fall ſo cloſe to each other as to be ſcarcely diſtinguiſhable. For this reaſon the orthographic projection is ſeldom uſed, except to exhibit the diſk * of the earth in a ſolar eclipſe.

In a map conſtructed by an *equatoreal* projection all the meridians will be ſtraight lines, and the parallels compleat circles having one of the poles of the earth for their common center.

If the projection is *meridional*, all the meridians will be curve lines excepting the middle one, which will be a right line; one of the poles will be exactly at the top of the map, and the other at the bottom;—and the decreaſe of all the parallels, from the Equator to either pole, will be exhibited in true proportion. It muſt alſo be remarked that the Equator will be a right line, and all the parallels will be curve lines.

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* *Disk*, or *Diſc*, among Aſtronomers, ſignifies the face of the Sun, Moon, Earth, or any other Planet, as it appears to a diſtant obſerver. It is generally ſuppoſed in eclipſes, to be divided into 12 equal parts, which are called Digits.

If the projection is *horizontal* the given place will be in the center of the map, and all the meridians, excepting that of the place, and likewiſe all the parallels, will be curve lines. It muſt however be remembered that we except the two poles; for the projection on the plane of their horizon will be *equatoreal*, as well as *horizontal*. But there is one advantage in the *horizontal* projection which ought not to be omitted; viz. that as the place, upon the horizon of which the projection is made, is always in the center of the map, we may find the bearing of any other place from it very exactly, if the map is accurately conſtructed. Thus much ſhall ſuffice for the conſtruction of a *general* or *univerſal* map, commonly called a *map of the globe*.

A *particular* map is only a part of a general one, and may be conſtructed upon the ſame principles; viz. by projecting the whole hemiſphere, and then taking ſo much out of it as the particular map is intended to contain. But the uſual projection for conſtructing particular maps is that upon the plane of the meridian; when we are to delineate a map of a ſmaller diviſion of the earth, if that diviſion lies near the Equator, we may repreſent the meridians and parallels by equidiſtant and parallel right lines. If it lies at a conſiderable diſtance from the Equator, the parallels may be equidiſtant and parallel right lines, and the meridians right lines converging a little towards the neareſt pole; or if the map is to be of any conſiderable extent (as, for inſtance,

ſtance, the map of *Europe*) the meridians may be right lines converging as above, and the parallels circular or curve lines. But if we are to delineate a map of a very ſmall diſtrict, as of a county or a hundred, whatever part of the earth it is in, the meridians and parallels muſt be equidiſtant, and parallel right lines drawn through every degree or minute of the longitude and latitude, according as the largeneſs of the map will allow.

PROBLEMS.

1. *To find the Diſtance of one Place from another on a particular Map.* If the two places lie directly eaſt or weſt, or directly north or ſouth the one from the other, you may find their diſtance immediately by the meridians or parallels; if the given places lie otherwiſe, take their diſtance with a pair of compaſſes, and apply it to the degrees of latitude or longitude on one of the edges of the map, or to the ſcale of miles at the bottom.

2. *To find the Latitude of any Place on a particular Map.* Stretch a thread over the given place, ſo as to cut the ſame degree and minute of latitude on the two outſide meridians, and you will there find the latitude required.

3. *To find the Longitude of any Place on a particular Map.* Stretch a thread over the given place, ſo as to cut the ſame degree and minute on the uppermoſt and loweſt parallels, and you will find the longitude required. In the ſame manner you may find the difference of longitude between any two given places in the map, and conſequently what o'clock it is at one place when the time at the other is given,

by reckoning 4 ſeconds of time for every minute of longitude, or 4 minutes of time for every degree.

4. *The Latitude and Longitude of any Place in a particular Map being given, to find that Place.* Stretch two threads, the one over the given longitude, and the other over the given latitude, and you will find the place required on that point in the map where the threads interſect each other. It is plain from hence that if you draw upon a ſheet of paper all the requiſite meridians and parallels, at every minute, &c. of latitude and longitude, you may eaſily fill up the map of any particular country, &c. when the latitudes and longitudes of all the places to be inſerted in it are previouſly known.

In the particular maps, by which the preceeding problems are to be ſolved, the meridians and parallels are all ſuppoſed to be right lines. If they are expreſſed by *curves*, you may either draw with a pencil, or imagine to be drawn, a line exactly parallel to the parallel or meridian upon which the ſolution of your problem depends.

The *bearing* of one place from another may be very nearly found upon any map, by a careful inſpection of the meridian lines, which are always drawn from north to ſouth, the north end of them conſtantly terminating in the upper edge of the map, and the ſouth end in the lower edge.

Practical Rules for the Conſtruction of Maps.

(1.) Deſcribe the *primitive circle* (which repreſents the Meridian, the Equator, or the Horizon upon the plane of which your map is to be conſtructed) deſcribe this circle with a radius taken from the line of chords upon your ſcale by opening the compaſſes from 0 to 60.

Then (2.) to conſtruct a general ſtereographic map upon the plane of the Equator (from which the map of Europe is generally taken) ſet off upon the radius of the primitive circle, beginning from the center, 10, 20, 30, 40, 50, 60, 70 and 80 degrees, taken ſucceſſively from the line of ſemi-tangents on your ſcale; and through thoſe diviſions deſcribe as many concentric circles, to repreſent the parallels of latitude; and laſtly, to repreſent the meridian lines, draw right lines from the center to the circumference at equal diſtances from each other.

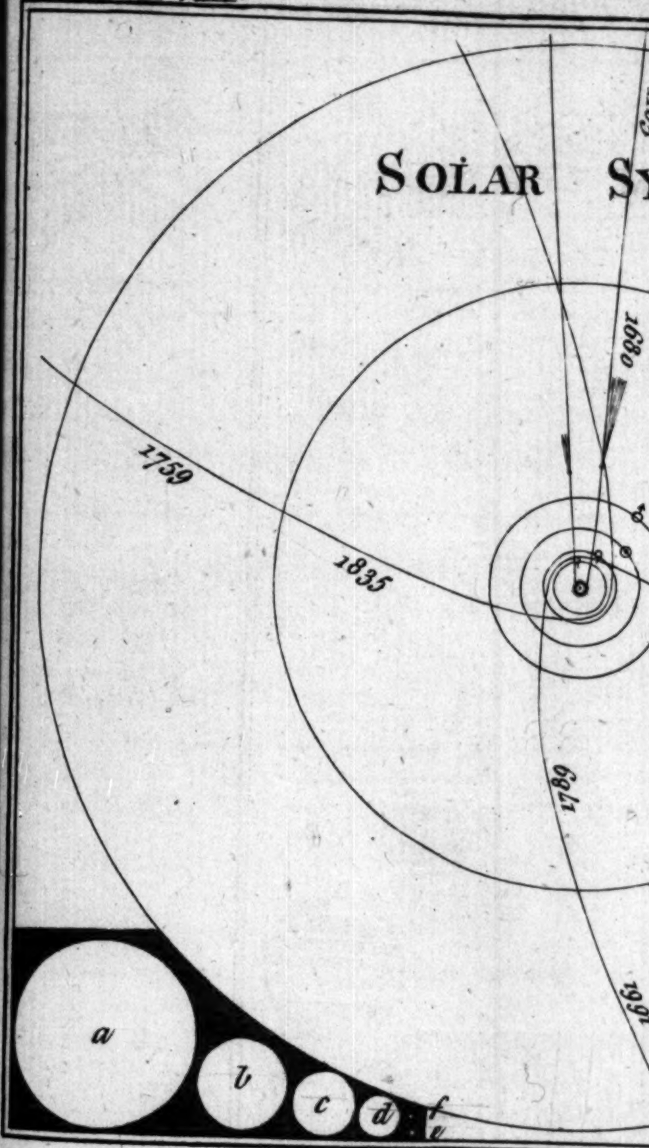
(3.) To conſtruct a general orthographic map upon the plane of the Equator, proceed in all reſpects as in the preceding one; only obſerve that you muſt mark off the diviſions upon the radius for the parallels of latitude from the line of ſines, inſtead of the line of ſemi-tangents.

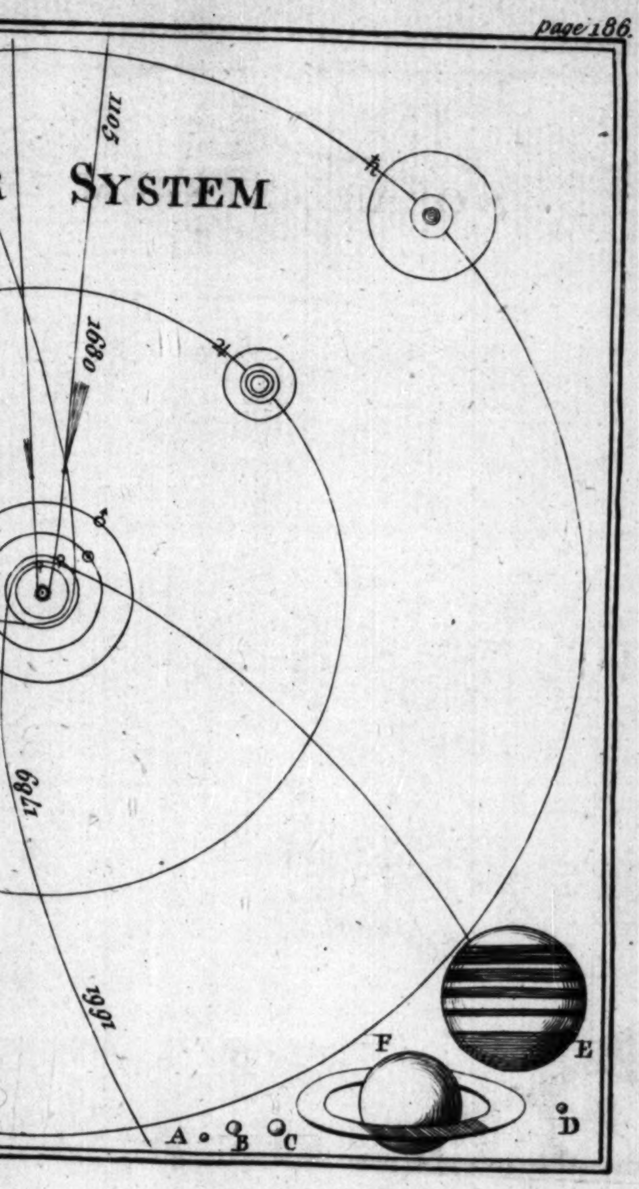
(4.) To conſtruct a general ſtereographic map upon the plane of the meridian, (from which the maps of Aſia, Africa, and North and South America are generally taken) draw a diameter through the primitive circle to repeſent the Equator, and another at right angles with the former to repreſent the middlemoſt meridian. Then, for the meridian next to the middle one (repreſented by a right line) ſet off from the center of the primitive circle upon either half of the Equator 10 or 15 degrees, taken from the line of ſemi-tangents; and likewiſe from the center ſet off on the other half of the Equator produced, 80 or 75 degrees (being the complement of the former) taken from the line of tangents, to repreſent the point from whence as a center, after opening the compaſſes to the point or diviſion firſt found, you are to deſcribe the meridian required. All the other meridians are to be found in the ſame manner. To deſcribe any parallel of N. or S. latitude, as ſuppoſe the firſt at ten degrees, ſet off from the center of the principal circle on the middle meridian ten degrees, taken from the line of ſemi-tangents; and from that point ſet off on the middle meridian produced, 80 degrees (that is, the complement of the former) taken from the line of tangents; then from the laſt point thus found, and with the compaſſes thus opened to 80 degrees, deſcribe the parallel required.

(5.) For a general orthographical map on the plane of the Meridian, you muſt uſe the line of ſines inſtead of that of ſemi-tangents; and all the parallels of latitude are to be right lines parallel to the Equator.

As to ſtereographic and orthographic maps on the plane of the Horizon, they are very ſeldom if ever made uſe of in ſchools; and their conſtruction requires too large an explanation to be inſerted in the preſent Treatiſe. I have therefore thought it ſufficient to give a draught of the former, that the learner might not be wholly unacquainted with the nature of them.

PLATE.VIII.




SYSTEM
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PART THE FOURTH:

CONTAINING THE

ELEMENTS

OF

ASTRONOMY,

AND

CHRONOLOGY.

ASTRONOMY is a ſcience which conſiders the various properties and motions of the heavenly bodies. The name is derived from *αϛϱον* a *ſtar*, and *νομος α law*.

By the heavenly bodies we mean the Sun, Stars, Planets, and Comets.

The Sun and Stars are large bodies of fire, which enlighten the reſt of the univerſe.

The Planets are large compoſitions or ſyſtems of matter, which have no light of their own, but borrow it from their reſpective ſuns.

The Comets are large opaque bodies, like the planets; but their motions are in various directions, and their orbits ſo extenſive that they fly off from the Sun, almoſt in a ſtraight line, to an immeaſurable diſtance.

Though it is highly probable that every ſtar is a ſun, and ſurrounded by its reſpective planets, the diſtance between us and the ſtars is ſo amazingly great, that the only planets we have any knowledge of are thoſe which are enlightened by the *Sun*, commonly ſo called. Thoſe planets are ſix in number, viz. Mercury ☿, Venus ♀, the Earth ⊕, Mars ♂, Jupiter ♃, and *Saturn* ♄; to which we may add the *ſecondary* planets, or moons, frequently called *ſatellites*, which belong to and attend ſome of the *primary* ones.

N. B. In the annexed plate, which repreſents the ſolar ſyſtem, A and *a* ſignify Mercury; B, *b*, Venus; C, *c*, the earth; D, *d*, Mars; E, *e*, Jupiter; and F, *f*, Saturn: It muſt alſo be obſerved, that in the right corner are given the proportional magnitudes of the planets, the Sun being ſuppoſed equal to the orbit of Saturn; and that in the left corner are given the proportional diſks of the Sun, as beheld from the ſeveral planets.

SECT. I. *Of the Solar Syſtem.*

The planets and comets, moving round the Sun as their center, conſtitute what is called the *Solar ſyſtem.* Although this ſyſtem was generally received by the ancient Pythagoreans, who, it is probable, firſt learned it from the Egyptians; yet the Ptolemaic Syſtem, which ſuppoſed the earth to be at reſt in the center, and the whole heavens to revolve round it, was commonly received and defended till about the year 1500, when *Copernicus* revived the ancient aſtronomy, and ſupported it in ſo clear a manner, that it has been generally adopted from that time to the preſent. For that reaſon it is frequently called the *Copernican Syſtem.*

Taking it for granted, therefore, that the Sun is the center of our ſyſtem, and that all the planets move regularly round him; the planet which is neareſt to the Sun will be *Mercury*, the orbit of *Mercury* is included within that of *Venus*, the orbit of Venus within that of the *Earth*, the orbit of the Earth within that of *Mars*, the orbit of Mars within that of *Jupiter*, and the orbit of Jupiter within that of *Saturn*. The two firſt of the above-mentioned planets are called *inferior* ones, becauſe their *orbits* are circumſcribed by that of the Earth; and, for the contrary reaſon, Mars, Jupiter and Saturn, are called *ſuperior* planets.

To account for the periodical revolutions of the planets round the Sun, it will be ſufficient to obſerve; (1.) that all motion is naturally rectilineal and uniform, and would continue ſo in every inſtance *ad infinitum* if not prevented by ſome intervening force; (2.) that every larger body will naturally attract a ſmaller one. The curve and almoſt circular motion of the planets round the Sun is owing to a combination of the abovementioned projectile force, which the Creator has impreſſed upon each of them, and the attractive force of the Sun which is much the largeſt body in the ſyſtem. The motion of the Satellites round their reſpective planets may be rationally accounted for in the ſame manner.

The ſquares of the times of the periodic revolutions of the planets are conſtantly to each other as the cubes of their diſtances from the central body. From hence it will not be very difficult to conceive that thoſe planets which are neareſt the Sun muſt not only finiſh their circuits ſooner, but likewiſe move faſter in their reſpective orbits, than thoſe which are more remote from him.

Beſides the periodical or annual revolutions of the planets, which are all performed from weſt to eaſt, and determine the length of their years, they have likewiſe a motion round their axes, which determines the length of their days; during which that half of the planet's ſurface, which is turned towards the Sun, is enlightened, and the other half covered with darkneſs. This is called their *diurnal* rotation, and may be illuſtrated by the ſimilar motion of a bowl which, when it is whirled from the hand into the open air, continually turns round as it moves forward. That the Sun, and the planets Venus, Mars, and Jupiter are conſtantly turning round their axes, is evident from the maculæ or ſpots which are viſible upon their ſurfaces; for thoſe maculæ are obſerved to move regularly over their diſks. We may very reaſonably conclude from hence that Mercury and Saturn, [whoſe maculæ are not viſible, becauſe the one is too near, and the other too remote from the Sun, to be ſo diſtinctly ſeen] and likewiſe the Earth on which we live, have the ſame diurnal rotation as the other planets. But there is one remarkable effect of ſuch a motion, by which we may judge with certainty whether the Earth turns upon its axis or not. It is well known to philoſophers that, by the force of gravity or attraction, all large ſyſtems of matter, which do not revolve upon their axes, muſt become perfect ſpheres; and that, on the contrary, thoſe bodies which continually turn upon their axes muſt become oblate ſpheroids; for as the equatoreal parts move quickeſt, the centrifugal force muſt cauſe them to recede fartheſt from the axis of motion, and make the equatoreal diameter to be larger than the polar one. But that our Earth is really an oblate ſpheroid, is demonſtrable from the unequal vibrations of a pendulum *, and the unequal lengths

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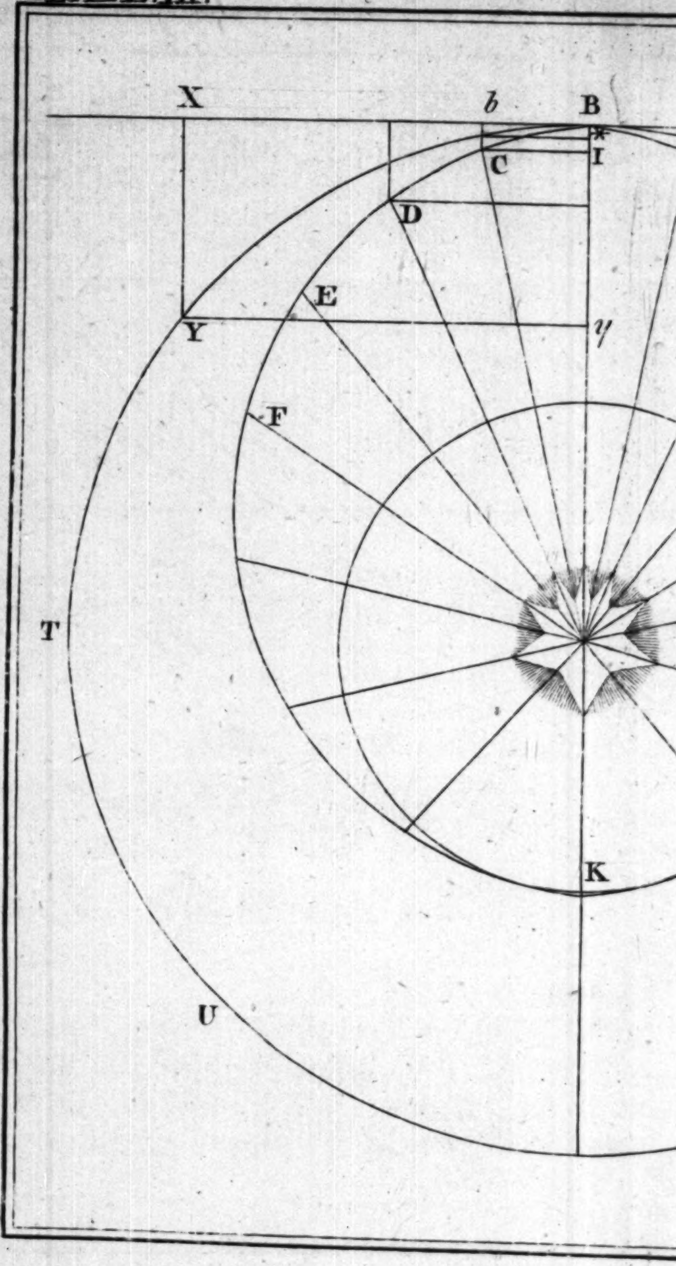
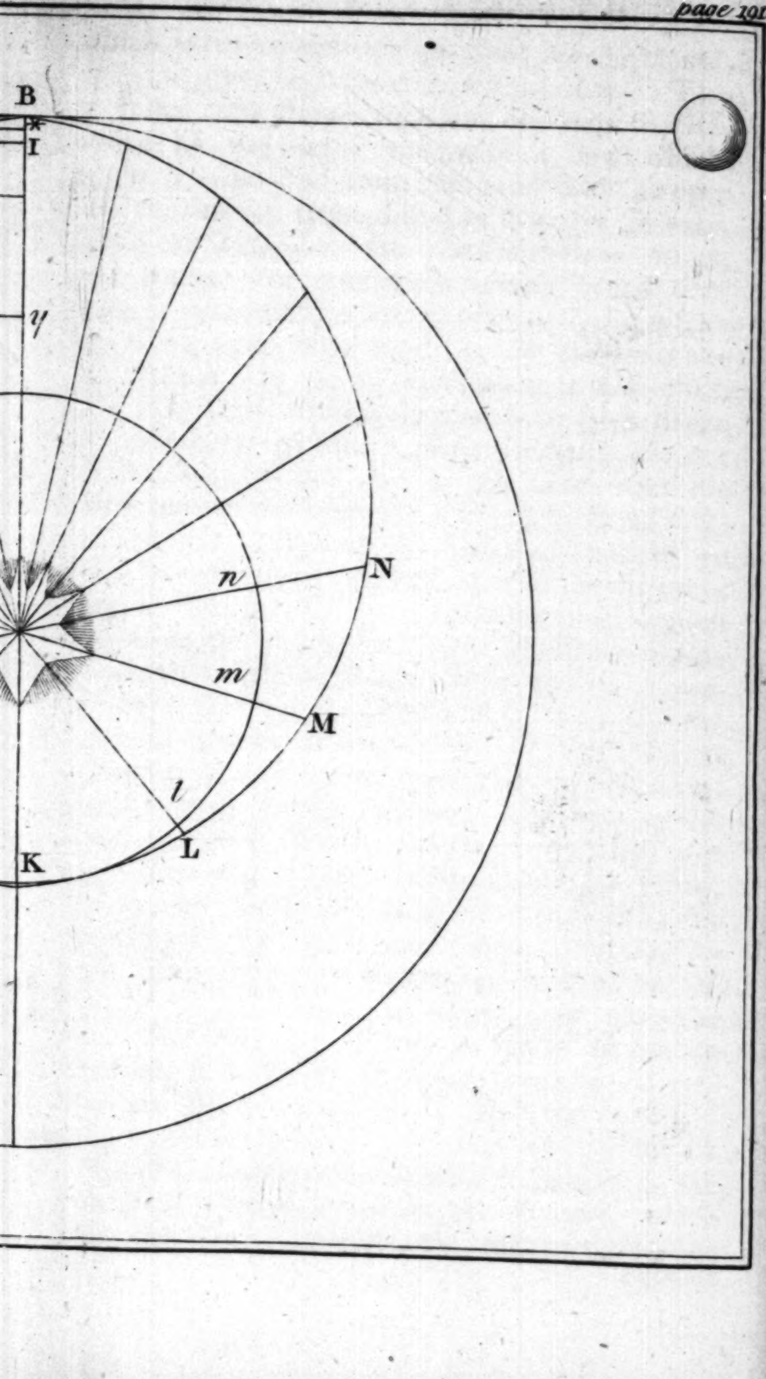
* A Pendulum which vibrates Seconds near the Poles will vibrate ſlower at the Equator, which ſhews that it is leſs attracted, and has leſs weight at the Equator

PLATE. IX.



page 191.



lengths of degrees upon any given meridian, as they have been actually meaſured in different latitudes. It will therefore follow, ſince no other rational cauſe can be aſſigned, that the oblate figure of the Earth muſt be owing to it's continual revolution round it's axis. We may add that if the Sun was to go round the Earth in 24 hours, his known diſtance from it is ſo great that, by a fair computation, he muſt travel upwards of 300,000 miles in a minute, and the ſtars, being at leaſt 400,000 times as far from the Sun as the Sun is from us, thoſe about the Equator muſt move 400,000 times as faſt. But what reaſonable man can admit the probability of ſuch a rapid motion, when the ſame purpoſe may be as fully and much more ſimply anſwered by the Earth's turning round upon it's axis towards the eaſt every 24 hours! As to the common objection that there are ſeveral expreſſions in the holy ſcriptures which ſeem to contradict this diurnal rotation of the Earth, it will be ſufficient to anſwer that the ſcriptures were never intended to inſtruct us in aſtronomy, but in the principles of religion and morality; and that, for this reaſon, they always expreſs themſelves upon natural ſubjects according to the common apprehenſions of mankind. Men of ſenſe, even in the preſent age, when not treating purpoſely of the ſciences, have followed the ſame method; and if the inſpired writers had done otherwiſe, they would have been ſtared at as madmen, inſtead of being reverenced as prophets.

To give a more accurate idea of the heavenly Planetarium, or of the annual revolutions or orbits of the planets already mentioned, we may

ſuppoſe

Equator than at the Poles, and conſequently is farther from the center of the Earth.

ſuppoſe the orbit of the Earth to be a thin even plane, cutting the Sun through the center, and extended as far as the ſtarry heavens, where it will mark out a great circle called the *Ecliptic*, which hath been before deſcribed. The planes of the orbits of all the other planets will cut the Sun into halves in the ſame manner: but when extended to the ſtarry heavens, they will form circles different from each other and from the *Ecliptic*, the one half of each of them being on the north ſide of the *Ecliptic*, and the other half on the ſouth ſide; or, in other words, the one half will be above the *Ecliptic*, and the other half below it. Conſequently the orbit of each lanet will croſs the *Ecliptic* in two oppoſite points, which are called the planet's *nodes*. It muſt likewiſe be remarked that the nodes of all the planets are in different parts of the *Ecliptic*; ſo that if the planetary tracks were viſible in the heavens, they would reſemble the different ruts of waggon-wheels croſſing one another in different parts: but as the planes of the planets orbits never make an angle of above eight degrees with that of the Ecliptic, theſe tracks will all be included within the Zodiac. That node of any planet from which it aſcends above the Ecliptic, towards the north, is called it's *aſcending node*; and the oppoſite one from which it deſcends below the Ecliptic, towards the ſouth, is called the *deſcending node*.

We have already obſerved that the curvilinear motion of all the planets ariſes from a uniform projectile force, which would cauſe them to move in right lines, and that univerſal power of attraction which draws them off from thoſe lines. If theſe projectile and attractive forces were ſo balanced, as that the projectile velocity of a planet would be equal to that which it would have acquired by gravity or attraction alone, in falling through half it's diſtance from the center of the Sun, the planet would then move round the Sun in a circle. Thus, in the annexed ſcheme, if a planet at B is attracted toward the Sun, ſo as to fall from B to Y in the ſame time that the projectile force would have carried it from B to X, the combined action of thoſe two forces will cauſe it to deſcribe, in the given time, the arch BY; and, in the ſame manner, if the two given forces continue to operate in the ſame proportion as at firſt, the planet will by degrees move round the whole circle, BYTU. But, on the other hand, if, while the projectile force would have carried the planet from B to b, the Sun's attraction ſhould be ſo great as to bring it down from B to I, inſtead of from B to *, the planet would then deſcribe the curve B C. When the planet comes to C, the attractive or gravitating power (which always increaſes as the ſquare of the diſtance from the Sun decreaſes) will become ſtill ſtronger, and accelerate the planet's motion, all the way from C to K, and cauſe it to deſcribe the unequal curves BC, CD, DE, EF, &c. each in equal times. By this continual increaſe of it's velocity, the planet will acquire ſo muh centrifugal force, or tendency to fly off from the Sun, when it comes to K, that inſtead of being brought nearer to him in the Circle K l m n, it will go off, and aſcend in the curve K L M N, &c. it's velocity decreaſing from K to B, as gradually as it had before increaſed from B to K; becauſe the attraction of the Sun, which before accelerated the planet's motion, will now continually retard it in the ſame proportion. When the planet has returned to B, it's projectile force will be in the ſame ſtate as when it firſt left it; and, conſequently, the planet will then proceed to deſcribe the ſame orbit again, by virtue of the ſame forces or powers.

The orbits of all the planets are of the figure we have been deſcribing; that is, they are ellipſes; but ſuch ellipſes as are little different from circles. It will likewiſe reſult from what has been ſaid, that the Sun muſt be in one of the focuſes of each ellipſis, or nearly ſo, which focus is called the *lower focus*. That the orbit of the Earth is really an ellipſis, and not a perfect circle, is well known from common experience. For if the orbit were circular, the Sun's apparent diameter would always be the ſame; but, on the contrary, when the Sun is in the eighth degree of Capricorn, his apparent diameter is one minute and ſeven ſeconds of a degree longer than when he is in the eighth degree of Cancer, which proves that he is much nearer to us in the winter than in the ſummer. This may ſeem a paradox to many, who will naturally think that the Sun muſt be neareſt to us when he gives the greateſt heat, and that he appears to be more diſtant from us in December than in June. As to the Sun's being hotter in proportion as he is nearer, it is very true that he will be ſo where his rays are perpendicular; but to us, who live at a great diſtance from the Equator, the greater obliquity of his rays in the winter, their paſſage through a larger portion of the atmoſphere, and his ſhorter continuance above our Horizon, will produce a contrary effect: and as to his greater apparent diſtance, this muſt be eſtimated only from the zenith of the place where we live, and not from the center of the Earth.

In the language of aſtronomers, that part of any planet's orbit which is fartheſt from the Sun, is called it's *Aphelion*, or *Aphelium*; and the oppoſite or neareſt point, it's *Perihelium*. Theſe points, when the Earth is conſidered as the center of the univerſe, are called the *Apogee* and *Perigee*. By modern Aſtronomers, they are frequently called the *Apſides*; and a line drawn from the Perihelion to the Aphelion is called *the line of the Apſides*. The diſtance that the Sun has gone *from* his Apogee at any given time (and not the diſtance he has to go *to* it) is called his *mean Anomaly*, and is reckoned in ſigns and degrees. Thus if the Sun is gone 142 degrees from his Apogee, his mean Anomaly is 4 ſigns, and 22 degrees; if 230 degrees, it is 7 ſigns, and 20 degrees.

The diſtance from the lower focus, or place of the Sun, to the center of the Ellipſis or planetary orbit, is called the planet's *Eccentricity*. The planets, as they are ſeen from the Earth, may be in *conjunction*, either with each other, or with the Sun. They are ſaid to be in conjunction *with each other* when any two or more of them are on the ſame ſide of the Sun, and in the ſame part of the Zodiac. Any one of them is ſaid to be in conjunction *with the Sun*, when it comes between the Sun and the Earth, or when the Sun is between the Earth and the planet. If the planet is between the Sun and the Earth it is called *an inferior conjunction*; if beyond the Sun, *a ſuperior conjunction*. It is evident from hence that the inferior planets, viz. Mercury and Venus, may have both a ſuperior and inferior conjunction with the Sun; but that the ſuperior planets, Saturn Jupiter and Mars, can have only one conjunction, which will be a ſuperior one. It is by obſerving theſe different conjunctions of the planets that we are able to determine which of them move in orbits circumſcribing that of the earth, and which not; for thoſe which have both conjunctions muſt neceſſarily be nearer to the Sun than we are, and thoſe which have only a ſuperior conjunction muſt have their orbits more remote. In an inferior conjunction, when a planet croſſes any conſiderable part of the Sun's diſk, that conjunction is called a Tranſit, and the planet will then appear upon the ſurface of the Sun like a dark round ſpot.

When the Earth is between the Sun and any of the planets, that planet is then ſaid to be in *oppoſition to the Sun.* Hence it appears that the only planets which can have ſuch an oppoſition are the ſuperior ones. Any two planets are likewiſe ſaid to be *in oppoſition to each other*, when they are *diametrically* oppoſite, i. e. in oppoſite parts of the Zodiac, or 180 degrees aſunder. The conjunction and oppoſition of a planet to the ſun are both indifferently called it's *Syzyges.*

The greateſt diſtance at which any inferior planet is ſeen from the Sun, is called it's *Elongation*; and it is by this circumſtance that we determine the relative magnitude of their orbits. Thus, as the greateſt elongation of Mercury is but twenty-eight degrees, whereas that of Venus is 47°, we may rationally conclude that the orbit of Mercury is circumſcribed by that of Venus.

As all the planets move with different degrees of velocity, and in orbits of different magnitudes (the moſt remote conſtantly moving ſloweſt, and in the largeſt orbit, and ſo *vice verſâ*;) it will follow that as they are viewed from the Earth they muſt ſometimes appear to move *direct*, or according to the order of the ſigns from weſt to eaſt; ſometimes to be *ſtationary*, or without any viſible change of place; and ſometimes *retrograde*, or to move backwards. But, if they were ſeen from the Sun, they would always appear *direct*, or to have that conſtant progreſſive motion which they really have. It will likewiſe be eaſy to conceive that the planets, when in different parts of their orbits, will appear to us of very different magnitudes. Thus Mars will ſometimes appear to be as large as Jupiter, and at other times ſo ſmall as not to be diſtinguiſhed from the fixed ſtars but by the redneſs of his aſpect.

That all the planets are really opaque bodies, like the Moon, and borrow their light from the Sun, is evident from their appearing, when obſerved through a teleſcope, with all the various phaſes or changes of the Moon.

As the periodical revolutions of the planets round the Sun have been determined by repeated obſervations to great exactneſs; and as it is evident, from the principles of mechanics, that the ſquares of thoſe periodical times are to each other as the cubes of their diſtances from the Sun; their *relative* diſtances may by this means be aſſigned very accurately. Accordingly, if the diſtance of the Earth from the Sun be once exactly determined, we may from thence diſcover the *true* diſtances of all the other planets.

§ II. *A more particular Account of the Planets.*

MERCURY is the planet which (as we have already obſerved) is nearer to the Sun than any of the reſt, and for that reaſon he is ſeldom ſeen. This is likewiſe the reaſon why we are unable to determine either the time of his diurnal rotation, or the inclination of his axis to his orbit. From the time of his ſuperior to his inferior conjunction he riſes and ſets after the Sun, and can then be ſeen only in the evening; but from his inferior to his ſuperior conjunction he riſes and ſets before the Sun, and will be ſeen only in the morning. The great heat he muſt neceſſarily receive can be no more an argument to *us* that he is not inhabited, than the ſame circumſtance would be to the inhabitants of Jupiter or Saturn that our Earth is not inhabited. The Almighty can as eaſily form different bodies which are ſuited to the temperature of the different planets they live upon, as he hath formed creatures which are ſuited to the very different climates and elements in our earthly globe.

VENUS, the next planet in order, appears in her greateſt luſtre when ſhe is removed from the Sun about 40 degrees. When ſhe appears weſt of the Sun ſhe riſes before him, and is called the *Morning-ſtar*; and when ſhe appears eaſt of the Sun ſhe ſhines in the evening after he ſets, and is called the *Evening-ſtar*; being each in it's turn for 290 days, though the whole of her annual or periodic revolution does not exceed 225 of our days. This, at the firſt view, may ſeem a paradox; but it is eaſily ſolved by obſerving that the Earth is continually going round the Sun the ſame way as Venus, though not ſo faſt, ſo that the relative or apparent motion of the latter will be conſiderably ſlower than her real motion. Her axis is 5 ½ degrees more inclined to her orbit than the axis of the Earth is to the Ecliptic; to which if we add the comparative ſhortneſs of her year, it will follow that the declination of the Sun from her equator muſt not only be far greater, but much ſwifter than with us. This circumſtance appears to be providentially ordered to moderate the heat of the Sun, which is twice as great in Venus as with us, and to give the heated parts of her ſurface a ſufficient time to cool before the Sun becomes vertical in the ſame place again. It is therefore highly probable, for the ſame reaſon, that the ſame phænomenon may belong to Mercury; though perhaps the inclination of his axis may be a little greater. We cannot diſcern that there is any moon or ſatellite either to Venus or Mercury; but this is far from being a proof that they have none.

The *Earth* has been ſufficiently deſcribed already, in a former part of this work: we ſhall therefore proceed to it's ſatellite the MOON, emphatically ſo called. The mean diſtance of the Moon from the Earth is 240,000 miles; and ſhe compleats her orbit round it, from a given fixed ſtar to the ſame again, in 27 days, 7 hours, and 43 minutes, which is called a *periodical month*. But the time between two of her conjunctions with the Sun, *i. e.* from one new moon to the other, is 29 days, 12 hours, and 44 minutes, which is called a *ſynodical month*: for as the Earth is continually moving forwards, the Moon, after compleating one revolution, will have a ſmall arch to deſcribe to get between the Earth and Sun again, which will take up 2 days 5 hours and 1 minute, or the difference between a ſynodical and periodical month. At the time of her conjunction, or when ſhe comes between the Sun and the Earth, ſhe will be inviſible, becauſe her dark ſide is then turned towards us; when ſhe begins to depart from her conjunction, (at which time ſhe is conſidered as *a new moon)* a very ſmall part of her enlightened hemiſphere will be viſible to us, and appear horned. As ſhe advances farther in her orbit, her enlightened hemiſphere will gradually diſcover itſelf more and more, till we ſee one half of it in the form of a ſemicircle. She is then ſaid to be in her *firſt quarter*; after which, as her enlightened part will be continually more enlarged to our view, ſhe will appear gibbous, or convex on both ſides; till at length, when ſhe comes in oppoſition to the Sun, her whole illuminated hemiſphere will become viſible. She is then called the *full moon*; and from that time ſhe continually decreaſes, as ſhe before increaſed, till ſhe comes to her *laſt quarter*, and from thence, till ſhe returns again to her conjunction with the Sun, and becomes wholly inviſible. It is ſufficiently evident from this continual change of the Moon's phaſes, or appearances, that ſhe is an opaque body, and borrows her light from the Sun. If the Moon turns round her axis exactly in the time that ſhe goes round the Earth, the ſame parts of her ſurface, or very nearly ſo, will ſucceſſively appear to us in each of her periodic revolutions: as it hath therefore been found, by conſtant obſervation, that this is really the caſe, and that the ſame ſide of the Moon is always turned towards the Earth, this is an inconteſtable proof that ſhe revolves once round her axis preciſely in the time of her paſſage through her orbit. It is likewiſe evident that the Moon has no atmoſphere of any *viſible* denſity as we have, not only becauſe her edge, when viewed through a teleſcope in a clear night, appears always well defined; but becauſe the ſtars, which from time to time diſappear behind her, retain their full luſtre till they touch her very edge, and inſtantly emerge again with equal brightneſs; whereas, if ſhe had an atmoſphere, there would be a kind of miſt or hazineſs around her, which would make the ſtars look fainter when they are ſeen through it than at other times. It was formerly imagined, that the dark parts of the Moon were ſo many *Seas* *; but they are now diſcovered, ſays Mr. Ferguſon, by a more accurate obſervation through the teleſcope, to be large pits and caverns, whoſe ſhadows fall within them; for they are conſtantly dark on the ſides next the Sun, and moſt of them have little knobs or hillocks within them, which have likewiſe their reſpective ſhadows. But that ſhe has variety of mountains and hills is demonſtrable from the line which bounds her light and dark parts not being an even curve, but a broken one full of dents and notches. One of theſe mountains hath been calculated to be eight miles and a half high, i. e. almoſt three times higher than the higheſt mountain upon the earth.

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* In an Article in the public papers of December 13, 1771, the following obſervations are aſcribed to

The planet MARS is the neareſt of the ſuperior planets, and is but a fifth part as big as the Earth. For this reaſon if any moon attends him ſhe muſt be very ſmall, and has not yet been diſcovered by our beſt teleſcopes. As the ſtars, in their various appulſes to him, or when they are going behind his diſk, appear with a fainter light than uſual, we may conclude that he is ſurrounded

to Mr. Dunn, as an ocular demonſtration that they really *are* ſeas. " From the time of the change of " the moon, till the time of full moon, and from " the time of full moon, till the time of the change " of the moon, as far as the brown parts extend on " the illuminated part of the moon, they appear of " the ſame colour, and terminate in the arch of a " circle on the moon's ſurface, which arch is *ac-* " *curately* between the illuminated and unilluminated " part;——that thoſe brown parts are *never* viſible " *beyond* that line, nor inviſible *ſhort* of it;——and " therefore from the poſition of that line, as ſeen " from the earth, thoſe brown parts are in the ſur- " face of the moon's body, and as nothing but a " fluid can ſo exactly conform to that ſurface, there- " fore the brown parts of the moon are ſeas."

rounded by a very groſs atmoſphere; which, perhaps, may be the cauſe of his colour being fiery red. His axis is nearly perpendicular to the plane of his orbit; ſo that he has ſcarcely any diverſity of ſeaſons, and his days and nights are always equal.

JUPITER is the next ſuperior planet, and the biggeſt of them all, being above a thouſand times larger than the Earth. Upon this account, and to compenſate for the diminution of his light by his great diſtance from the Sun, he has four moons, and his days and nights are almoſt three times as ſhort as ours. He is likewiſe encircled by faint luminous ſubſtances, which are called his *belts*; but as a variety of changes have been obſerved in them, they are generally thought to be clouds. The axis of Jupiter is ſo extremely little inclined to his orbit, that he can have no ſenſible change of ſeaſons; a circumſtance which hath been very wiſely and benevolently contrived by the Father of the univerſe! For if the axis of Jupiter were inclined any conſiderable number of degrees, the ſpaces between his poles and polar circles, to the diſtance of that number of degrees, would be alternately covered almoſt ſix of our years (amounting to half one of his) with continual darkneſs; and as each degree of one of his great circles is nearly equal to 706 of our miles, we may eaſily conceive what prodigious tracks of land would hereby become uninhabitable. But, by the preſent ſituation of his axis, his poles, where only his fartheſt moons can be ſeen, will have the Sun conſtantly in their horizon, or more probably, by the refraction of his rays, ſome degrees above it.

The moſt diſtant of all the planets, both from the Sun and the Earth, is SATURN. For this reaſon, though he is not much above half as large as

Jupiter, he hath five moons to attend him. He is likewiſe ſurrounded by a thin broad *ring*, as an artificial globe is by the wooden Horizon. This ring is computed to be about twenty-one thouſand miles broad from it's upper to it's inward edge, which is equal to it's uniform diſtance from the planet's ſurface. It appears to the Saturnian inhabitants like a vaſt luminous arch in the heavens, reflecting the light of the Sun very copiouſly.

If therefore the axis of Saturn, as is probably the caſe, is perpendicular to his orbit, the ring, which is inclined 30 degrees to our Ecliptic, and nearly as many to the axis of the planet, will alternately appear and diſappear, once every natural day, to the Saturnian inhabitants to a conſiderable diſtance from his equator; I ſay alternately, becauſe only that ſide of the ring can be enlightened which is next to the Sun. Though the inclination of Saturn's axis to his orbit hath never been diſcovered, yet it is highly probable, from what has been already ſaid of *Jupiter*, that it is ſo very ſmall as to produce no ſenſible diverſity of ſeaſons. We are equally at a loſs to aſcertain the length of his days; becauſe no maculæ have yet been obſerved upon him to aſſiſt our enquiries.

It may perhaps be imagined, that becauſe Jupiter hath been computed to have only $\frac{1}{28}$ and Saturn but $\frac{1}{90}$ part as much light as the Sun communicates to us, theſe two planets muſt be too dark to be inhabited. But as the full moon with us affords light enough to travel by very agreeably, and yet, according to Dr. Smith's calculation, the light we receive from her is but a ninety thouſandth part of that which we receive from the Sun; it will follow, that the Sun gives a thouſand times as much light to Saturn as the full moon does to us, and more than 3000 times as much to Jupiter; ſo that with additional light of their moons, in the abſence of the Sun, they may be very comfortable places of reſidence to their reſpective inhabitants. It is likewiſe true, that their heat, ſo far as it depends upon the Sun, muſt be proportionally leſs than ours: but as the bodies of their inhabitants may be properly adapted to this circumſtance without a miracle, ſo it is poſſible that there may be ſomething in their nature or ſoil much warmer than in thoſe of our Earth. If we add that neither of them have any proper winter, even at their poles, their cold will not be ſo intenſe as is commonly ſuppoſed.

Upon the whole, if we conſider the noble apparatus of moons with which two of the ſuperior planets, and for ought we know the remaining one, are furniſhed, which can ſcarcely have been deſigned merely to gratify the curioſity of a few aſtronomers peeping through their teleſcopes; if we likewiſe conſider that they have not that great diverſity of ſeaſons which is ſo uſeful to the planets that are nearer the Sun, but would be highly inconvenient to them, and that all the planets in general by their rotation round their axes enjoy the viciſſitudes of day and night, and by their annual revolution round the Sun an alternate relief from their greateſt extremes of cold and heat, (which circumſtances can be of no poſſible uſe but to their own inhabitants) this will almoſt amount to a demonſtration that every planet is a habitable world, and full of rational beings who are capable of adoring the wiſdom and goodneſs of the Divine Architect! Beſides, upon our earthly globe, we may daily obſerve, that not only every element and every country abounds with animals, which are ſuited to the different climates, but that every leaf, every drop of water, and almoſt every atom ſwarms with life: how improbable then muſt it appear that ſuch large bodies as the planets, ſome of which are vaſtly bigger than the Earth, ſhould be made only to roll through the heavens, like ſo many huge globes of lifeleſs marble or iron, and at ſuch a diſtance that they appear to the naked eye to be no larger than ſo many ſtuds or ſmall patches!

To the above general account of the planets we ſhall ſubjoin the following table of their annual periods, diurnal rotations, diameters, mean diſtances from the Sun, eccentricities, inclination of their axes and orbits, aphelions, aſcending nodes, &c. &c.

A
TABLE
Of Diſtances and Periods of the Satellites.

Jupiter's Moons.	Diſtance in Semidiameters of Jupiter.		Periods round Jupiter.			Saturn's Moons.	Diſtance in Semidiameters of the Ring.		Periods round Saturn.		
			d.	h.	m.				d.	h.	m.
1	5	667	1	18	27	1	2	10	1	21	18
2	9	017	3	13	13	2	2	69	2	17	41
3	14	384	7	3	42	3	3	70	4	12	25
4	25	299	16	16	32	4	8	70	15	22	41
						5	25	35	79	7	48

A TABLE of the Periods, Revolutions, &c. of the Sun and Planets.

Sun and Planets.	Annual Revolution round the Sun.	Diurnal Rotation on it's Axis.	Diameter in English Miles.	Mean Diſtance from the Sun in English Miles.	Eccentricity of it's Orbit in English Miles.	Axis inclined to Orbit.	Orbit inclined to Ecliptic.	Place of its Aphelion.	Place of it's Aſcending Node.	Proportion of Bulk.	Proportion of Light and Heat.	Characters or Marks.	Colours of the Planets.
	d. h.	d. h.											
Sun	0 0	25 6	763000	00,000,000	00,000,000	8° 0′	0° 0′	——	——	877650	45000		——
Mercury	87 23	Unknown	2600	32,000,000	6,720,000	Unkn.	6° 54′	♐ 13° 8′	♉ 14° 43′	$\frac{1}{27}$	6½	☿	Spark red
Venus	224 17	24 8	7906	59,000,000	413,000	75° 0′	3° 20′	♒ 4° 20′	♊ 13° 59′	1	1¾	♀	Yel.white
Earth	365 6	1 0	7970	82,000,000	1,377,000	23° 29′	0° 0′	♑ 8° 1′	——	1	1	⊕	——
Moon	365 6	29 12¾	2180	82,000,000	13,000	2° 10′	5° 18′	——	Variable	$\frac{1}{50}$	1	☽	——
		h. m.											
Mars	686 23	24 40	4444	125,000,000	11,439,000	0° 0′	1° 52	♍ 0° 32′	♉ 17° 17′	$\frac{1}{5}$	$\frac{3}{7}$	♂	Fiery red
Jupiter	4332 12	9 56	81000	426,000,000	20,352,000	0° 0′	1° 20	♎ 9° 10′	♋ 7° 29′	1049	$\frac{1}{28}$	♃	Splen.white
Saturn	10759 7	Unknown	67000	780,000,000	42,735,000	Unkn.	2° 30′	♐ 27° 50′	♋ 21° 13′	586	$\frac{1}{90}$	♄	Dim red

In this table we have likewiſe included the Sun, who is the center and ſoul of the whole ſyſtem, or planetarium. He is an immenſe globe of fire; and, as is evident by the motion of the ſpots upon his ſurface, turns regularly round his axis in the time ſpecified in the table. Though he is the central body, the various attractions of the circumvolving planets give him a ſmall motion round the center of gravity of the ſyſtem. It is from him that every planet derives it's light and heat, which are always communicated in greater or ſmaller portions, not only in proportion to their diſtance from him, but according as his poſition is more or leſs oblique to any given part of the planet's ſurface. This is the reaſon, as already hinted, that we, who live at ſuch a diſtance from the Equator, have the coldeſt weather when the Sun is neareſt to us, viz. in the winter: for as the eccentricity of the Earth's orbit bears but a trifling proportion to the diſtance of the Earth from the Sun, and therefore of itſelf can occaſion no great difference of heat and cold to us in the different ſeaſons, it will follow, that the remarkable difference we experience muſt be owing to the relative direction of the Solar Rays. Thus in winter the Sun's Rays fall ſo obliquely upon us, that any given number of them will not only fall with leſs force, but muſt be ſpread over a greater portion of our part of the Earth's ſurface. Beſides, the Sun's continuance above the Horizon is conſiderably ſhorter in the winter, and the nights are much longer; which muſt farther contribute to increaſe the cold.

Some may imagine from hence, that as the Sun always gives moſt heat when his rays are moſt perpendicular, the hotteſt part of our ſummer ſhould be when the Sun is in the firſt degree of Cancer,

cer, i. e. towards the latter end of June. But experience tells us, that the weather is commonly hotteſt in the latter part of the ſummer. This may eaſily be accounted for as follows. When any part of the Earth's ſurface has once been fairly heated, it will retain the heat for ſome time; and as the nights, which in the middle of ſummer are very ſhort, increaſe but ſlowly, and the days are proportionably long, the heat of the Earth muſt be continually augmented in the day-time more than it is diminiſhed in the night, till the Sun has declined conſiderably from the Tropic in his return to the Equinoctial. For this reaſon, the month of July and great part of Auguſt will be hotter than June, unleſs prevented by winds and rains; in the ſame manner as we generally find it hotter in the afternoon than in the forenoon. On the other hand, thoſe places which have thoroughly cooled will require ſome time to recover their heat; ſo that the weather will be colder a month or two after the winter ſolſtice than before it.

It is further worth remarking, that the Sun's rays are ſo much refracted, or bent down towards the earth, by the atmoſphere, at his riſing and ſetting, as to bring him in ſight every clear day before he reaches the Horizon in the morning, and keep him in view for ſome minutes after he has really deſcended below it in the evening. At ſome times of the year, we ſee him ten minutes longer above the Horizon than we ſhould do if it were not for this circumſtance, and about ſix minutes every day at a mean rate. The cauſe of *twilight* may be explained upon the ſame principle: for when the Earth, by its diurnal rotation, has withdrawn the Sun from our ſight, he ſtill continues to ſhine upon the atmoſphere above us, where his light gradually aſcends, and, conſequently, decreaſes to us till he is 18 degrees below the horizon;

after which, the part of the atmoſphere above us loſes his rays entirely, and becomes dark. As the refraction of the Sun's rays will always be greateſt where the air has the greateſt denſity, that is, where the climate is coldeſt, the Sun will appear longer above the Horizon in ſuch climates, and the duration of twilight will be longer than it is uſually computed with us; which is another inſtance of the great wiſdom and benevolence of the Deity.

As the Sun and Moon, at their riſing and ſetting, are ſeen through a greater quantity of the atmoſphere, and through more vapours, and, conſequently, (as being ſeen more indiſtinctly, and yet without any diminution of their diſks) are naturally imagined to be much farther off than at other times when they are at any conſiderable height above the Horizon, they will then appear bigger, as well as of a more dim and fiery aſpect. It is likewiſe obſervable, that they appear of an oval figure juſt after their riſing and before their ſetting; the reaſon is, becauſe the refraction of their rays being always greater at the Horizon than at any diſtance above it, their lowermoſt limb will appear to be proportionably more elevated, or to riſe rather faſter than the uppermoſt.

Thus then we have given a ſhort account of the moſt remarkable phænomena of the Sun, and his ſurrounding planets. We ſhall now proceed to take ſome notice of the *comets* and *fixed ſtars*.

§. III. *Of the* COMETS.

The Comets are large opaque bodies, with long tranſparent tails which iſſue from that ſide of them which is oppoſite to the Sun. Their ſubſtances muſt have a ſurpriſing degree of denſity, and be of a nature almoſt incorruptible; for ſome of them are ſo violently heated, that they would otherwiſe diſſipate into fumes and vapours in a few ages. Sir Iſaac Newton has computed the heat of the comet which appeared in 1680 to be, when it was neareſt to the Sun, 2000 times greater than that of red hot iron; and that the comet would therefore retain its heat till it came round to the Sun again, though its periodic revolution were to exceed 20,000 years. Some of the comets are viſible before they reach the Sun, and begin to put forth their tails, which at firſt are ſhort and thin, ſeldom exceeding 15 or 20 degrees in length, but gradually become longer and denſer as they approach their perihelion. But moſt of them continue inviſible till they have got round the Sun, when they ſend forth tails which are ſeen under an angle of 40, 50, or even 60 degrees; though, as the comets continue to recede, their tails are gradually diminiſhed both in length and ſplendor. It muſt, however, be obſerved, that the tail of a comet is always larger and longer at any diſtance in its receſs from the Sun, than at the ſame diſtance in its acceſs. The tail of the comet abovementioned, which appeared in 1680, was computed to be 80 millions of miles in length.

The other particulars, in which the comets differ from the planets, are; (1) they move in various directions, ſome of them the ſame way as the planets (that is from weſt to eaſt) and others of them the contrary; (2) their orbits are not confined within the Zodiac, but admit of any inclination to the Ecliptic whatever; and (3) the eccentricity of their orbits is amazingly greater.

To account for the laſt-mentioned particular, that is, the uncommon eccentricity of their orbits, it will be ſufficient to obſerve, that the projectile forces of the comets in their aphelia, or when they are fartheſt from the Sun, are almoſt next to nothing; ſo that their velocities, in their acceſs to the Sun, muſt be continually increaſed in ſuch a very large proportion by his attractive powers, that their motion will by degrees become almoſt rectilinear, and be ſo extremely rapid in their perihelia, or the lower part of their orbits, as to overpower the Sun's attraction there, and cauſe them to aſcend again to the higher parts of their orbits with a velocity which will continually decreaſe in the ſame proportion as it had before increaſed in their acceſs or deſcent. As their projectile forces are ſo very inconſiderable in the higher part of their orbits, it is plain, that if they were not there at a prodigious diſtance from the Sun, their velocity could not be ſufficiently increaſed in their acceſs to prevent them from falling into him, even before they have arrived at their perihelia. The vaſt rapidity of their motion is the reaſon that they are viſible to us for ſo ſhort a time; and their being ſo long before they come near enough to be ſeen again, after they have once diſappeared, is owing to the amazing length of their orbits.

It is believed, that there are at leaſt 21 comets belonging to our ſyſtem: but the periods of only three of them are known with any degree of certainty. The firſt of theſe comets appeared in the years 1531, 1607, 1682, and 1758, and may be expected every 75th year afterwards. The ſecond appeared in 1532, and 1661, and may be expected again in 1789, and every 129th year ſucceſſively. The third made its laſt appearance in 1680, as we have already obſerved; but as its periodical revolution is 575 years, we are not to look for its return till the year 2225. This comet, at its greateſt diſtance, is computed to be 11,200 millions

lions of miles from the Sun: and its neareſt diſtance only 496,000 miles from the Sun's center, or about 114,500 miles from his ſurface; ſo that the Sun as beheld from the comet in its perihelium muſt cover almoſt half the firmament. In the lower part of its orbit, or when it is neareſt to the Sun, it flies at the rate of 880,000 miles an hour, or above 14,000 miles in a minute,—a degree of rapidity which almoſt ſurpaſſes imagination!

Some viſionaries have concluded from the intenſe heat, the groſs atmoſphere, and the ſeemingly liquified ſtate of the comets, that they are ſo many places of torment for the damned. But if we reflect that wherever the Deity exerts his power, he likewiſe manifeſts his wiſdom and goodneſs,—that he is able to form creatures which are ſuited to all poſſible ſtates and circumſtances,—that matter, ſo far as we are acquainted with it, exiſts chiefly for the uſe and accommodation of intelligent beings,—and that ſome centuries ago a great part of the Earth was judged to be uninhabitable, through the extremes either of heat or cold, which is now found to be otherwiſe; it will not appear impoſſible, nor indeed altogether improbable, that ſuch numerous and large maſſes of durable matter as the comets, however unlike our Earth, may be inhabited by beings who are capable of contemplating with gratitude and wonder the aſtoniſhing ſymmetry and beauty of the creation, which may be obſerved more diſtinctly in their extenſive tour through the heavens, than in the narrow circuits of the planetary worlds! Admitting the probability of ſuch a ſentiment, it will even appear neceſſary, conſidering their amazing diſtance from the Sun in their aphelia, that the comets ſhould be ſo intenſely heated as they are computed to be; though they may differ as much from each other in their reſpective degrees of heat and light as the bodies of the planets.

§. IV. *Of the* FIXED STARS.

The *fixed ſtars* are ſo called, becauſe they are commonly obſerved to keep the ſame diſtance from each other. The number of them in each hemiſphere which are viſible to the naked eye, is not above a thouſand: and the *Britiſh* Catalogue, which includes many others that cannot be ſeen without a teleſcope, contains no more than 3001 in the whole.

*LIST OF STARS.

Number.	1ſt Magnitude.	2d.	3d.	4th.	5th.	6th.	7th.	
943	7	11	43	94	169	445	174	In the Zodiac.
1511	4	23	93	227	356	695	113	In the N. Hemiſphere.
547	4	20	56	136	145	176	10	In the S. Hemiſphere.
3001	15	54	192	457	670	1316	297	Total.

The ſtars appear of different magnitudes; which is probably owing to their different diſtances from the Earth. Thoſe which appear the largeſt are called *ſtars of the firſt magnitude*, the next largeſt are called *ſtars of the ſecond magnitude*, and ſo on to the *ſixth*, which are the ſmalleſt that can be ſeen without the aſſiſtance of glaſſes. The reſt, which can be diſcovered only through a teleſcope, are, for that reaſon, called *teleſcopic ſtars*.

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* For the moſt remarkable Stars Vide Table in part the 2d. of this Treatiſe.

That the ſtars are at an immenſe diſtance from the Earth is evident from what has been already ſaid concerning the long paths of the comets; for, if the comets in their aphelia were not much further from the ſtars than from the Sun, they could not keep clear of their attraction. This is likewiſe evident from their not appearing bigger through the beſt teleſcopes than to the naked eye: nay, in fact, they appear much leſs, becauſe their rays are kept more diſtinct. The neareſt of them may be computed to be at leaſt 32,000,000,000,000 miles from us; ſo that their rays of light (though they fly 17,000 miles in a minute) would be ſeveral years in reaching the Earth. The immenſe diſtance of the ſtars is a proof that they ſhine by their own proper light; for if they did not they would be as inviſible to the naked eye as the ſatellites of Jupiter, which appear larger through a good teleſcope than any ſtar of the firſt magnitude.

If the Sun were ſeen at the ſame diſtance from us as the ſtars, it is eaſy to prove that it would appear no bigger than they do. This is a ſufficient argument, that the ſtars are as large as the Sun. If we add to this that we receive incomparably more light from the Moon than from all the ſtars together; and that much the greateſt part of them are inviſible without the help of inſtruments; it will be abſurd to imagine that they were created only for the benefit of our Earth. On the contrary, it is highly probable from the above circumſtances, that every ſtar is a Sun to a ſyſtem of planetary worlds,—an idea which extends the wiſdom, power, and benevolence of the Deity, beyond the reach of imagination!

We have already obſerved, that for the more ready diſtinction of the ſtars, aſtronomers have divided them into different *aſteriſms* or *conſtellations*. Thoſe which could not be conveniently brought into any particular conſtellation, are called *unformed ſtars*. The number of the *ancient* conſtellations is 48; but upon our modern globes we have about 70. The ſtars in each are uſually diſtinguiſhed by the letters of the Greek alphabet, α denoting the largeſt ſtar, ϐ the ſecond, γ the third, and ſo on; by which means we may as readily mention any ſtar we pleaſe as if it had a particular name. The author of this ingenious contrivance was Mr. *Bayer*.

In a clear night we may obſerve a remarkable track in the heavens, in ſome parts appearing ſingle, and in others double, which, from it's peculiar whiteneſs, is called the *Milky-way*. This has been generally thought to be a colection of a prodigious number of very ſmall ſtars.

There are likewiſe ſeveral *lucid ſpots* in the heavens, which appear larger and brighter through the teleſcope, but without any ſtars in them. One of theſe, which lies between the ſtars ζ and η in the conſtellation of *Hercules*, is viſible to the naked eye in the abſence of the Moon.

The *cloudy* or *nebulous ſtars* are ſo called from their appearing like dim ſtars, when they are viewed without an inſtrument: but through a teleſcope they appear to be large illuminated ſpaces in the heavens, with one or more ſtars in them. The moſt remarkable of them is that in the middle of *Orion's ſword*, in which ſeven ſtars have been obſerved, which ſeems to ſhine through a cloud. It appears like a gap in the ſky opening into a much brighter part of the univerſe. Though moſt of theſe ſpaces or openings are ſeen under an angle of but a few minutes, yet, conſidering their immenſe diſtance, they muſt be much larger than our whole ſolar ſyſtem; and they ſeem to be enlightened by a perpetual uninterrupted day among numberleſs worlds, which no human art will ever be able to diſcover.

There are ſeveral ſtars which appear and diſappear periodically; as the *ſtella mira*, or wonderful ſtar, in the neck of the *Whale*, which becomes almoſt inviſible, and then gradually recovers it's luſtre ſeven times in ſix years. Theſe are called *periodical ſtars*, and their regular diſappearance is ſuppoſed to be owing to the intervention of their large maculæ or ſpots as they turn round their axes.

There are likewiſe ſeveral ſtars mentioned by ancient aſtronomers, which are not at preſent to be found: and there are others not contained in the ancient catalogues, which are now viſible to the naked eye. The latter are called *new ſtars*; but theſe, and alſo others which have been obſerved to increaſe their magnitude very remarkably, may perhaps be ſuns whoſe fuel was almoſt ſpent, and afterwards recruited by ſome of their comets falling into them, and thus occaſioning an uncommon blaze: and indeed it is the opinion of many, that this is the greateſt uſe of the cometary part of every ſyſtem.

We have already obſerved that, the Earth being an oblate ſpheroid, the protuberant parts of the Equator are attracted in an oblique manner by the Sun, ſo as to be conſtantly drawn to a nearer coincidence with the Ecliptic; nor is it leſs probable, that the mutual attraction of all the planets have a continual tendency to bring all their orbits to a general coincidence with each other. If this ſentiment be admitted, it will not be difficult to conceive, that the apparent ſituation of the ſtars muſt in time be ſomewhat changed.

Before we take our leave of the fixed ſtars, it will not be improper to remark, that there is one of the ſecond magnitude, at the extremity of the tail of the Urſa Minor, or Leſſer Bear, which, from it's proximity to the north pole, is called the *polar* or *north ſtar*. It's longitude according to Mr. Flamſtead is 24° : 14′ : 14″ : and its latitude 66° : 4′ : 11″. As it is therefore very near the pole, and conſequently never ſets to the northern hemiſphere, it has been of great ſervice in navigation, as alſo for determining the meridian line, the elevation of the pole, and the latitudes of different places. It hath likewiſe furniſhed ſome with an objection of great ſeeming weight, againſt the annual revolution of the Earth round the Sun; viz. that the axis of the Earth, which always keeps parallel to itſelf in this ſuppoſed annual revolution, muſt in different parts of it's orbit point to different ſtars, whereas, on the contrary, it is conſtantly obſerved to point towards the polar ſtar. But if we conſider that the Earth's whole orbit is but a point, when compared with the immenſe diſtance of the ſtars, this objection will immediately vaniſh. To illuſtrate what we ſay, if we lay a flat ruler upon a table in ſuch a manner that the edge of it be directed to any given object ten or twelve miles off, and afterwards lay another ruler ſo as to be parallel to the firſt, and two or three feet diſtant from it, we ſhall find that the edge of the ſecond ruler appears to be directed to the ſame object.

Beſides the general deſcription we have given of the ſolar ſyſtem and fixed ſtars, there are ſeveral particulars, moſt of them more immediately relating to the Earth, with which the young aſtronomer ſhould not be wholly unacquainted. We ſhall therefore conſider each in a ſeparate ſection.

§ V. *Of the different Lengths of Days and Nights, and the Viciſſitudes of the Seaſons.*

In all places which have a *right ſphere*, or which lie under the Equator, the days and nights will be conſtantly equal to each other; becauſe the Sun's diurnal path, in whatever degree of the Ecliptic he is, will always be at right angles with the Horizon, and conſequently one half of it will be above the Horizon, and the other half below it. For the ſame reaſon the duration of twilight in thoſe places will always be the ſame, and ſhorter than in any other places, the Sun's deſcent below the Horizon being conſtantly direct or perpendicular.

At the poles, whoſe ſphere is a *parallel* one, the Sun will be conſtantly above the Horizon one half of the year, and below it the other; and their twilight, both before the Sun riſes and after he ſets, will continue many days, becoming gradually ſtronger in the former caſe and weaker in the latter.

In all thoſe places which have an *oblique* ſphere, the days and nights will be equal when the Sun is in the equinoctial points; becauſe, in whatever manner you raiſe or depreſs the pole, the Equator will be conſtantly biſected by the Horizon. But as the Sun advances from the firſt of Aries towards the ſummer tropic, the days will continually grow longer, and the nights ſhorter, and when he again declines towards the Equator, the days will continually grow ſhorter, and the nights longer in the ſame proportion, till they become equal at the autumnal equinox: the days, however, will always be longer with us than the nights, while the Sun is on the north ſide of the Equator; becauſe, as may be readily ſeen upon the globe when properly rectified, his *diurnal* arch will then exceed a ſemicircle, and conſequently be greater than the *nocturnal* arch; i. e. he will deſcribe a greater arch, and continue longer above the Horizon than below it. On the other hand, as he removes from the Equator towards the winter tropic, the length of the nights will continually become greater than that of the days, becauſe the *nocturnal* arch will then exceed the *diurnal*. It may likewiſe be obſerved, by conſulting the globe as before, that the more the pole is elevated, the greater will be the difference between the *diurnal* and *nocturnal* arches, and conſequently between the length of the days and nights, except at the two equinoxes when they are every where equal. It may eaſily be underſtood from what has been ſaid, (ſuppoſing the Sun to continue as long in the ſouthern half of the Ecliptic as in the northern) that, taking one time with another, every part of the world will have him above their Horizon one half of the year, though his rays will always fall more obliquely, and therefore afford leſs heat the nearer we approach to the poles.

As to the difference of the ſeaſons, the cauſe of it may be very conciſely and yet plainly repreſented by the annexed figures. In figure the firſt, the Sun is perpendicular to the Equator, as it always is in the firſt of Aries and Libra; ſo that the enlightened hemiſphere is there bounded by the two poles. This may repreſent the vernal and autumnal equinoxes. In figure the 2d. the Sun is vertical or perpendicular to the tropic of Cancer; ſo that the intire ſpace between the Arctic Circle and north pole is then illuminated, while that between the Antarctic Circle and ſouth pole is wholly covered with darkneſs. This may repreſent our ſummer ſolſtice. In figure the 3d, the Sun is perpendicular to the tropic of Capricorn, which happens about the 21ſt of December; ſo that all the ſpace between the antarctic circle and ſouth pole is then enlightened, and the oppoſite ſpace round the north pole is entirely dark. This may repreſent our winter ſolſtice.

This variety of ſeaſons may be very pleaſantly repreſented, by placing a candle upon the center of a large round table, ſo that the lighted part of the candle may be of the ſame height as the center of an artificial globe. For if the north pole of the globe be elevated to 66½ degrees, ſo as to bring the plane of the Ecliptic parallel to that of the table, and the globe be afterwards moved round the edge of the table, in ſuch a manner that the axis may conſtantly point the ſame way, or continue parallel to itſelf; we ſhall then ſee the light gradually ſhifting from one pole to the other, till each in it's turn becomes alternately illuminated or covered with darkneſs; and when the candle is oppoſite that part of the Equator which is interſected by the Horizon, the northern and ſouthern hemiſpheres will appear equally enlightened. If the globe, while it is moved round the table, were to be continually turned round it's axis, we ſhould alſo have a very natural repreſentation of the different lengths of days and nights above mentioned.

PLATE X.

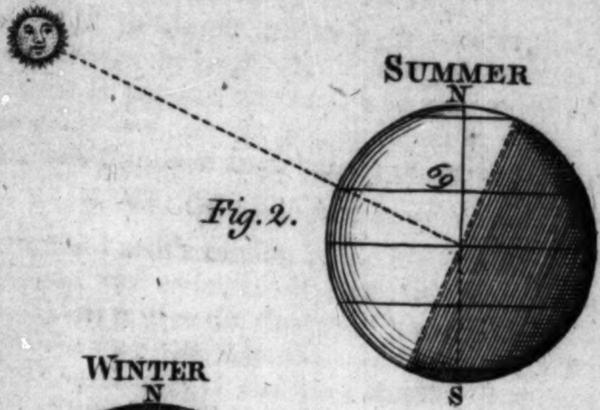

Fig. 2.

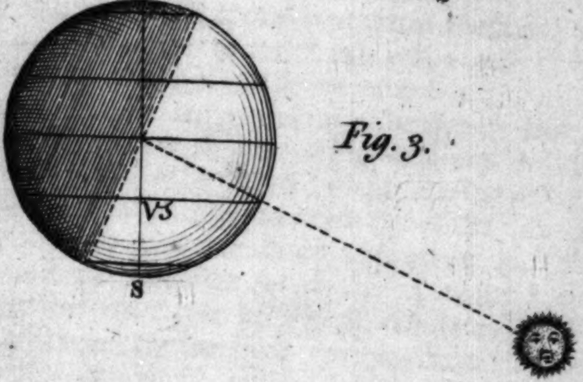

Fig. 3.

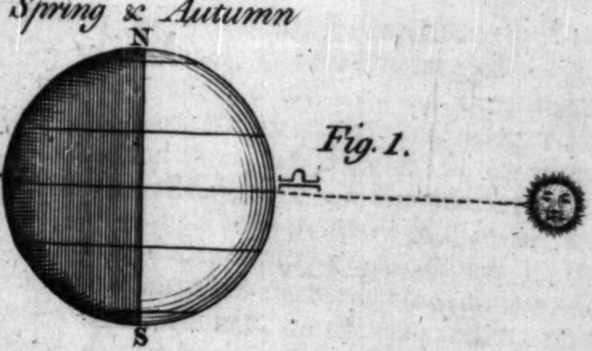

Fig. 1.

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It will be almoſt needleſs to obſerve that, in the ſouthern hemiſphere, it is conſtantly winter when it is ſummer with us, and *vice verſâ*: and that *under and near the line*, or Equator, they muſt have two ſummers and as many winters every year.

§ VI. *Of the Equation of Time.*

As the Earth's motion round it's axis is perfectly uniform, and equal at all times of the year, and *ſydereal* days (or the ſpaces of time between any ſtar's leaving the Meridian and returning to it again) are always of the ſame length; if the plane of the Ecliptic coincided with that of the Equinoctial, and the orbit of the Earth was a perfect circle, there would likewiſe be the ſame conſtant equality in the length of the *ſolar* days. But as the Ecliptic has a manifeſt obliquity to the Equinoctial, and to the axis of the Earth, the Sun, whoſe apparent annual motion is round the Ecliptic, cannot always revolve from any given meridian to the ſame meridian again in 24 equal hours, as they are meaſured by a well regulated clock; and conſequently the ſolar days muſt be unequal, —a difference which will be found to be the ſame in all latitudes.

This may be demonſtrated mechanically, and in a very eaſy manner, by an artificial globe. For if we make a chalk at every 10th or 15th degree both of the Ecliptic and Equator, beginning at the firſt of Aries, and then turn the globe ſlowly round towards the weſtern edge of the Horizon, we ſhall ſee all the marks from Aries to Cancer, and from Libra to Capricorn, come ſooner to the brazen Meridian than their correſponding marks upon the Equator: and, on the other hand, thoſe from Cancer to Libra, and from Capricorn to Aries, will not come to the Meridian till their correſponding marks upon the Equator have paſſed it. But the marks upon the firſt degrees o Aries, Cancer, Libra and Capricorn, will either be upon or exactly even with thoſe upon the Equator.

Acording to this repreſentation, a good clock and a true ſun-dial would ſhew exactly the ſame time of the day on March the 20th, June the 21ſt, September the 23d, and December the 21ſt. But as the Earth's orbit is elliptical, and conſequently the apparent motion of the Sun (who is eight days longer in the northern half of the Ecliptic, than in the ſouthern) muſt be faſter at ſome times than at others, this will cauſe a ſecond inequality, which combined with the former produces that difference of time which is ſpecified in the common equation-tables; ſo that a true ſun-dial and a well regulated clock will never agree but on the 15th of April, the 16th of June, the 31ſt of Auguſt, and the 24th of September. It will be unneceſſary to remark, that the equatoreal time, or that which is repreſented by the motion of the chalk-marks which are to be made upon the Equator, is the time which is ſuppoſed to be ſhewn by a good clock; and that the other, which is repreſented by the motion of the marks upon the Ecliptic, is the *ſolar* time.

§. VII. *Of the Harveſt-moon.*

As the plane of the Equator is perpendicular to the axis of the Earth, all parts of the Equator muſt make equal angles with the Horizon, both at their riſing and ſetting, and equal parts of the Equator will conſtantly riſe or ſet in equal times. But as the Ecliptic hath an obliquity to the Equator, the different parts of the former, either at their riſing or ſetting, muſt form very different angles with the Horizon; and thoſe parts which riſe with the largeſt angle will ſet with the ſmalleſt, and *vice verſâ*; as may be eaſily ſeen by elevating the pole of an artificial globe for any conſiderable latitude, and then turning it gently round it's axis towards the weſt. It will likewiſe appear, that when the Ecliptic forms the leaſt angle, either with the eaſtern or weſtern edge of the Horizon, the greateſt portion of it will riſe or ſet in any given time. Conſequently, as the Moon deviates ſo little from the Ecliptic, that we may conſider her as actually moving in it, ſhe will always riſe or ſet with the leaſt difference of time when ſhe is in thoſe ſigns which riſe or ſet with the ſmalleſt angles.

In the northern latitudes the Ecliptic forms the leaſt angle with the Horizon, when *Aries* riſes and *Libra* ſets, and the largeſt when *Libra* riſes and *Aries* ſets; ſo that in any equal time the greateſt portion of the Ecliptic will riſe about *Aries*, and the ſmalleſt about *Libra*, and conſequently, when the Moon is about *Libra* and *Piſces*, the difference of time in her riſing, for ſeveral days ſucceſſively, will be conſiderably leſs than when ſhe comes to *Virgo* and *Libra*.

As the Moon can never be full but when ſhe is in *oppoſition* to the Sun, and the Sun is never in *Libra* and *Virgo* but in our autumnal months, the Moon can never be full in the two oppoſite ſigns *Aries* and *Piſces*, but in autumn. This is the reaſon that we have two full moons in thoſe months, and in no other, which riſe near the time of ſunſet for a week together. The firſt of theſe, which is the moſt remarkable, is called the *Harveſt-moon*, and the latter the *Hunter's-moon*; the former riſes, at a mean rate, only twenty minutes later every night than on the preceeding, for ſix nights together, and ſeems to be ſo ordered by Divine Providence, to give the huſbandman an immediate ſupply of moon-light after ſun-ſet, for his greater convenience in gathering in his harveſt.

veſt. It is true that the Moon is in *Piſces* and *Aries* every month in the year, and muſt then riſe with as little difference of time as in autumn: but ſhe is never *full* in thoſe ſigns, nor riſes in them at ſun-ſet, except when the Sun is in the oppoſite ſigns, that is, in autumn.

In ſouthern latitudes the harveſt-moons will riſe in *Virgo* and *Libra*, when it is ſpring with us. But about the Equator, where the ſeaſons are not ſo variable, and the weather changes ſeldom and at ſtated times, the Moon conſtantly riſes about 50 minutes later every night than on the preceeding; her light not being ſo neceſſary there for gathering in the fruits of the earth, as in the northern or ſouthern climates of any conſiderable latitude. At the polar circles, where the mild ſeaſon is very ſhort, the autumnal full moon riſes at ſun-ſet from the firſt to the third quarter: and at the poles, where the Sun is abſent one half of the year, all the winter full moons conſtantly ſhine without ſetting. Theſe circumſtances are very ſtriking proofs of the great wiſdom and beneficence of the Deity! We may therefore reaſonably ſay with the pious Dr. *Young* in his Night-thoughts,

"*An undevout Aſtronomer is mad.*"

The phænomenon of our *harveſt-moon* may be very plainly and agreeably repreſented upon an artificial globe, in the following manner. As the Moon moves through the Ecliptic about 13⅙ degrees, at a mean rate, every day; put a ſmall patch or chalk-mark upon the Ecliptic about the 20th or 21ſt degree of *Aquarius*, and then counting towards *Aries*, put another patch upon the Ecliptic 13⅙ degrees from the firſt, a third at the ſame diſtance from the ſecond, and ſo on till you come to the ſeventh patch, which will be placed on the 9th or 10th degree of *Taurus*. Then rectifying the globe for the given latitude, (as ſuppoſe that of London) and bringing the firſt patch, or 20th degree of *Aquarius*, to the eaſtern edge of the Horizon, and ſetting the hour index to XII. (as being the moſt convenient hour to be remembered ;)—turn the globe gently towards the weſt, and you will find that the ſeven patches, which include as much of the Ecliptic as the Moon goes through in a week, will all riſe ſucceſſively in the time that the index goes over two hours. This ſhews that at the ſeaſon we are ſpeaking of, the Moon will not differ above two hours in her riſing for a whole week. If you try the ſame experiment upon the ſigns *Virgo* and *Libra*, beginning to place your patches at the 20th degree of *Leo*, you will find that when the Moon is in thoſe ſigns, ſhe will differ in her riſing for a week about four times as much as ſhe did before : and in both caſes, if you turn the globe till the patches come to the weſtern edge of the Horizon, one after the other, you may obſerve, that when the Moon differs leaſt in the times of her riſing, ſhe will differ moſt in the times of her ſetting, and *vice verſâ*.

§. VIII. *Of Solar and Lunar Eclipſes.*

As every planet and ſatellite derives it's light from the Sun, it muſt caſt a ſhadow (that is, intercept the ſolar rays) towards that part of the heavens which is oppoſite to the Sun.

When the light of the Sun is ſo intercepted by the interpoſition of the Moon, as that he appears to us to be wholly or partly covered, he is then ſaid to be *eclipſed* ; though in reality it is only the Earth which ſuffers an eclipſe. But when the Earth is interpoſed betwteen the Moon and Sun, ſo as to caſt a ſhadow upon the former, the Moon is then eclipſed. It is evident from hence that a *ſolar* eclipſe can happen only at the time of New Moon, or when the Sun and Moon are in *conjunction*; and a *lunar* eclipſe only at the time of Full Moon, or when the Sun and Moon are in *oppoſition.*

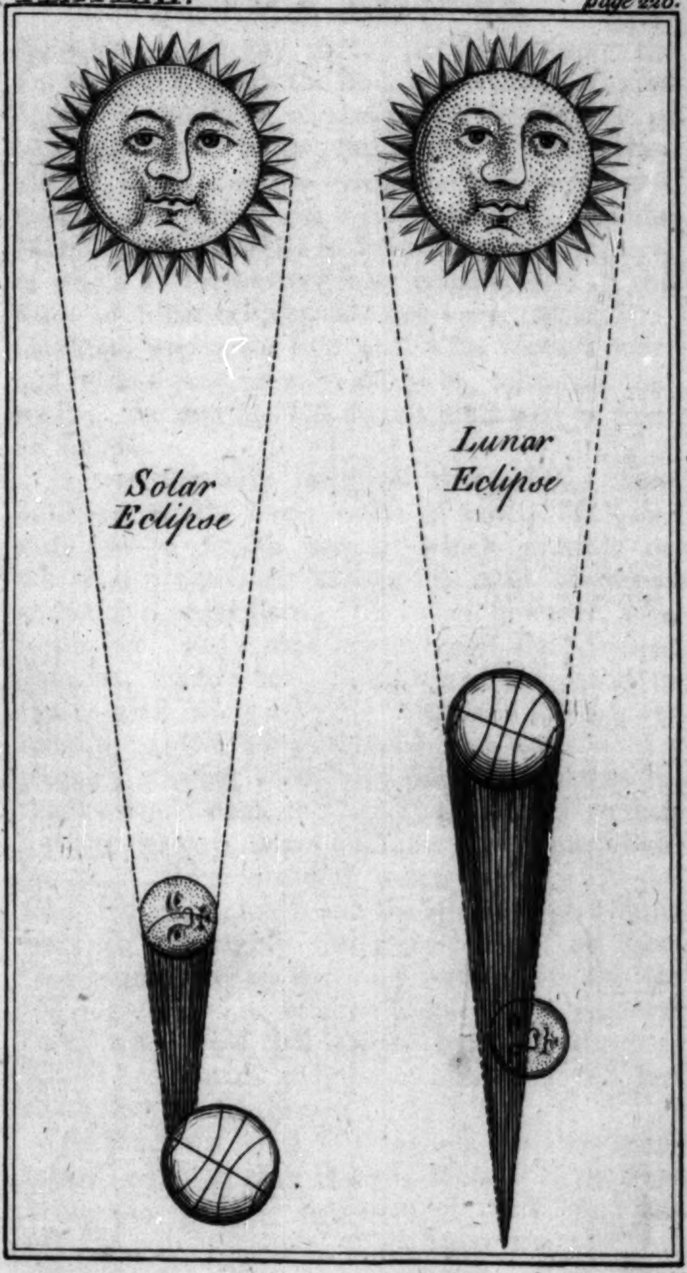
In all annular eclipſes of the Sun, the Moon's real ſhadow ends in a point at ſome diſtance from the Earth; which plainly proves that the Sun is vaſtly bigger than the Moon.

As it has been obſerved in a lunar eclipſe, that the Earth's ſhadow is large enough to cover the whole ſurface of the Moon, though it's diameter was three time greater than it is, we may conclude that the Earth is much larger than the Moon.

As the ſhadow of the Earth has never been long enough to eclipſe Mars, the neareſt of the ſuperior planets, when he was in full oppoſition to the Sun, it is very plain that the Earth muſt be much leſs than the Sun; and as the primary planets have never eclipſed each other, this is an ocular proof not only that the Sun is much bigger than any of them, but alſo that their diſtances from each other muſt be very conſiderable.

As the Sun and Moon are in conjunction with each other every new moon, and in oppoſition every full moon, it might be imagined that they ſhould both be eclipſed in their turns once a month; whereas the eclipſes of both luminaries are never more than ſeven, and generally not above four in a whole year. To ſolve this ſeeming paradox, it will be ſufficient to obſerve that one half of the Moon's orbit is elevated $5\frac{1}{2}$ degrees above the Ecliptic, and the other half as much depreſſed below it. But when the Moon is more than 17 degrees from either of the *Nodes*, or points of interſection, at the time of conjunction or new moon, ſhe is then too high or too low in

PLATE XI. page 226.



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her orbit to caſt any part of her ſhadow upon the Earth :—and when the Sun is more than twelve degrees from either of the nodes, at the time of oppoſition or full moon, the Moon likewiſe is then too far, either above or below the Ecliptic, to paſs through any part of the Earth's ſhadow. As the Moon's orbit therefore is divided into 360 degrees, of which 17 the limit of ſolar eclipſes, and 12 the limit of lunar eclipſes, are but very inconſiderable parts; and as the Sun croſſes the Moon's nodes but twice a year, it may eaſily be conceived that moſt of the new and full moons muſt part without an Eclipſe.

It was formerly imagined that eclipſes were ominous, or the fore-runners of ſome public calamity ;——a fooliſh notion which prevails no where at preſent but among the moſt barbarous and uncivilized nations. *Columbus*, however, who in the year 1493 was driven upon the coaſt of Jamaica, made a very artful uſe of it. Being in the greateſt want of proviſions, and the natives refuſing to aſſiſt him, he threatened them with a plague ; aſſuring them, as a previous token of it, that he would cauſe the Sun to be eclipſed on ſuch a particular day, when he knew the eclipſe would happen. This dreadful omen appeared at the time he had foretold ; and the ignorant inhabitants were ſo thoroughly convinced by it of his more than human power, that they were terrified to the laſt degree, and he was the happieſt man amongſt them who could firſt ſupply him with the proviſions he wanted, and throw himſelf at his feet to implore his forgiveneſs !

As the limit of a ſolar eclipſe (as abovementioned) is greater than that of a lunar one, we have more eclipſes of the Sun than of the Moon ; and yet the viſible eclipſes of the latter are more numerous than thoſe of the former. The reaſon is, the eclipſes of the Moon appear in their full magnitude to all parts of the neareſt hemiſphere of the Earth: but the ſolar eclipſes are viſible only to that ſmall portion of the Earth's enlightened hemiſphere which is covered by the Moon's ſhadow.

As the Moon's orbit is an ellipſis which hath the Earth in one of it's focuſes, ſhe muſt have an *Apogee* and *Perigee*, or a greateſt and leaſt diſtance from the Earth. When ſhe changes, or comes into conjunction with the Sun in her perigee, and ſo near her nodes as to cauſe a ſolar eclipſe, that eclipſe will be total to that part of the Earth upon which her ſhadow falls, and continue ſo for the ſpace of ſeveral minutes: but if the eclipſe happens when ſhe is in her apogee, her ſhadow will terminate in a point before it reaches the Earth, and to whatever place the point of the ſhadow is directed, the eclipſe will be *annular*, i. e. the edge or outward part of the Sun's diſk will appear like a luminous ring ſurrounding the body of the Moon. If the Sun is eclipſed when the Moon is at her mean diſtance from the Earth, the point of her ſhadow will juſt touch the Earth, and where it does ſo the darkneſs will be total, though ſcarcely of a moment's continuance. To account for this variety, it muſt be obſerved that the *nodes* of the Moon are not fixed, but continually change their poſition in ſuch a manner as to ſhift through all the ſigns and degrees of the Ecliptic in 18 years and 225 days.

As the Moon's apparent diameter when greateſt exceeds that of the Sun when leaſt only one minute and 38 ſeconds of a degree, and as ſhe will paſs through that difference in three minutes and 13 ſeconds of an hour, that will conſequently be the longeſt duration of the total darkneſs in the greateſt ſolar eclipſe that can happen; and the largeſt portion of the Earth's ſurface which will then be covered by the perfect ſhadow of the Moon, and experience a total darkneſs, will be about 180 miles in breadth. But the *penumbra*, or faint ſhadow which ſurrounds the perfect one, will cover a circular ſpace 4900 miles in diameter. It is almoſt needleſs to obſerve that in ſuch an eclipſe as this, the Moon muſt be in her *Perigee*, and the Sun in his *Apogee:* but it muſt be remarked that in all ſolar eclipſes, the general eclipſe begins when the penumbra firſt touches the Earth, and ends when the penumbra leaves the Earth.

If the Moon were ſurrounded by an atmoſphere of any conſiderable denſity, it would appear to touch the Sun a little before the Moon makes her appulſe to his edge, and occaſion a faintneſs on that ſide before it is actually eclipſed by the body of the Moon: but as no ſuch appearance has been obſerved, it is highly probable that ſhe has no ſuch atmoſphere as that of the Earth.

The Moon, even when ſhe is totally eclipſed, is not abſolutely inviſible when the ſky is clear, but appears like a round plate of tarniſhed copper or red-hot iron. This is owing to the ſcattered rays of the Sun which paſs through the air round the edge of the Earth's enlightened hemiſphere, and are thereby refracted through the ſhadow of the Earth, in ſuch a manner as to cauſe the perfect or entirely dark ſhadow to terminate in a point at a little diſtance from the Moon, ſo that ſhe is covered only by a *penumbra*, or imperfect ſhadow, which is in ſome meaſure enlightened by the refracted rays. But if the earth had no atmoſphere, the Moon would be as inviſible in a total lunar eclipſe, as when ſhe is in conjunction with the Sun.

Though the Moon, when ſhe is in the center of the Earth's ſhadow, is diametrically oppoſite to the Sun, yet ſhe has often appeared in the Horizon to be totally eclipſed when the Sun was viſible in the oppoſite part of the heavens. This alſo is owing to the refraction of the rays of light which cauſes both luminaries to appear above the Horizon, when they are actually below it.

A lunar eclipſe which is both central and total, continues three hours and 57 minutes from the beginning to the end of it, when the Moon is in her *Apogee*; and but three hours 37 minutes and 26 ſeconds when ſhe is in her *Perigee:* becauſe ſhe always moves ſloweſt when ſhe is fartheſt from the Earth, and quickeſt when ſhe is neareſt to it.

When the Moon paſſes only through a part of the Earth's ſhadow, or over a part of the Sun's diſk, the eclipſe is called a *partial* one.

Beſides the *aſtronomical* uſe of lunar eclipſes to aſcertain the periods of the Moon's motions, and the *geographical* uſe of both the lunar and ſolar eclipſes, (but chiefly of the former) to determine the longitudes of the different places in which they are viſible; they are both of great ſervice in chronology, to fix the time of any paſt events with which they happened to be co-incident.

Before I conclude this ſection, it will be highly proper to remark, that the doctrine of ſolar eclipſes is an inconteſtable proof that the memorable darkneſs which happened at the crucifixion of our bleſſed Lord and Saviour, muſt have been abſolutely *miraculous*. He ſuffered on the day of the Jewiſh paſſover, which was always kept at the full of the Moon; it was therefore impoſſible that this darkneſs could be owing to a natural eclipſe of the Sun, which never happens but at the new moon. Beſides, the total darkneſs in the greateſt eclipſes of the Sun never continues above four minutes; whereas that which happened at the crucifixion laſted three hours, and overſpread the whole land of *Judea.* Vid. MATTH. xxviii. 15.

§. IX. *Of the Preceſſion of the Equinoxes.*

We have already remarked, that the centrifugal force, which ariſes from the Earth's diurnal rotation upon its axis, muſt cauſe the parts under the Equator to be more protuberant, or to have a greater ſwell, than any other parts of the globe; and that, of conſequence, to make up the loſs of denſity about the plane of the Equator, the parts near the poles, whoſe centrifugal force muſt be very trifling, will be ſo much compreſſed by their being more powerfully attracted towards the center of the Earth, as to reduce it to the form of an oblate ſpheroid. Since therefore the axis of the Earth is inclined to the plane of the Ecliptic, and not perpendicular to it, it is evident that the Sun, by continually attracting the protuberant parts of the Equator towards the plane of the Ecliptic, muſt bring the Equator ſooner under him in every return he makes towards it from either of the Tropics, than would regularly happen if the Earth were a perfect ſphere; conſequently, if the Sun ſets out from any fixed point in the heavens, or from any particular ſtar, at the very moment he is departing from either of the equinoctial or ſolſtititial points, he muſt return to the ſame Equinox or Tropic again, before he arrives at the ſame ſtar or point in the heavens from which he began his courſe: ſo that with reſpect to the fixed ſtars, the equinoctial and ſolſtitial points muſt be continually receding towards the weſt. This is called the *preceſſion of the equinoxes*; becauſe they are hereby continually moving *in antecedentia*, or towards the ſigns which immediately preceed them. It has been computed that the equinoctial points recede fifty ſeconds of a degree in a year; ſo that the grand celeſtial period, or *great year*, at the expiration of which the equinoxes will again arrive at the ſame points, or under the ſame ſtars from which they receded, will be compleated in 25,920 tropical or ſolar years. As the Ecliptic and its axis are immoveable with reſpect to the fixed ſtars, it will follow from what has been ſaid, that each half of the Earth's axis muſt have a ſlow conical motion round that of the Ecliptic; and conſequently the direction of the poles muſt be continually though imperceptibly altered, and the axis of the Earth have a ſlow deviation from its paralleliſm; the Equator likewiſe, together with the Tropics, Polar Circles, &c. muſt in a courſe of years be deſcribed in the heavens, as the Earth turns daily round its axis, by very different ſtars from thoſe which deſcribe it at preſent.

It is owing to this preceſſion of the equinoxes, that the aſteriſm or conſtellation which in the infancy of aſtronomy was in the ſign *Aries*, is now got into the ſign *Taurus*, and that which was in *Taurus* into *Gemini*, and ſo on. It is likewiſe owing to the ſame cauſe, that thoſe remarkable ſtars, which are ſo frequently mentioned by the Grecian and Roman poets and philoſophers, do not viſibly riſe and ſet at the ſame ſeaſons now as they did in the times of thoſe writers.

As the preceſſion of the equinoxes can only affect the motions and declinations of the ſtars, it cannot be the cauſe of what is called the *anticipation* of the equinoxes, or ſeaſons of the year. This is wholly owing to the difference between the *civil* or *Julian* year, and the tropical or *ſolar* one; the former, as conſiſting of 365 days and ſix hours, exceeding the latter eleven minutes and three ſeconds;—a difference which in 1433 years amounted to eleven days, and cauſed our ſeaſons to fall ſo much backwards with reſpect to the days of the months. To rectify this difference, eleven nominal days were ſuppreſſed in the late alteration of the ſtyle. But as to the difference between the *tropical* and *ſydereal* year, or between the time in which the Sun moves from any of the equinoctial or ſolſtitial points to the ſame point again, and the time in which he returns to any fixed ſtar from which he ſet out at the beginning of the year;—this is entirely owing to the preceſſion of the equinoxes, by which the *ſydereal* year becomes above twenty minutes longer than the *tropical.*

§. X. *Of the Tides.*

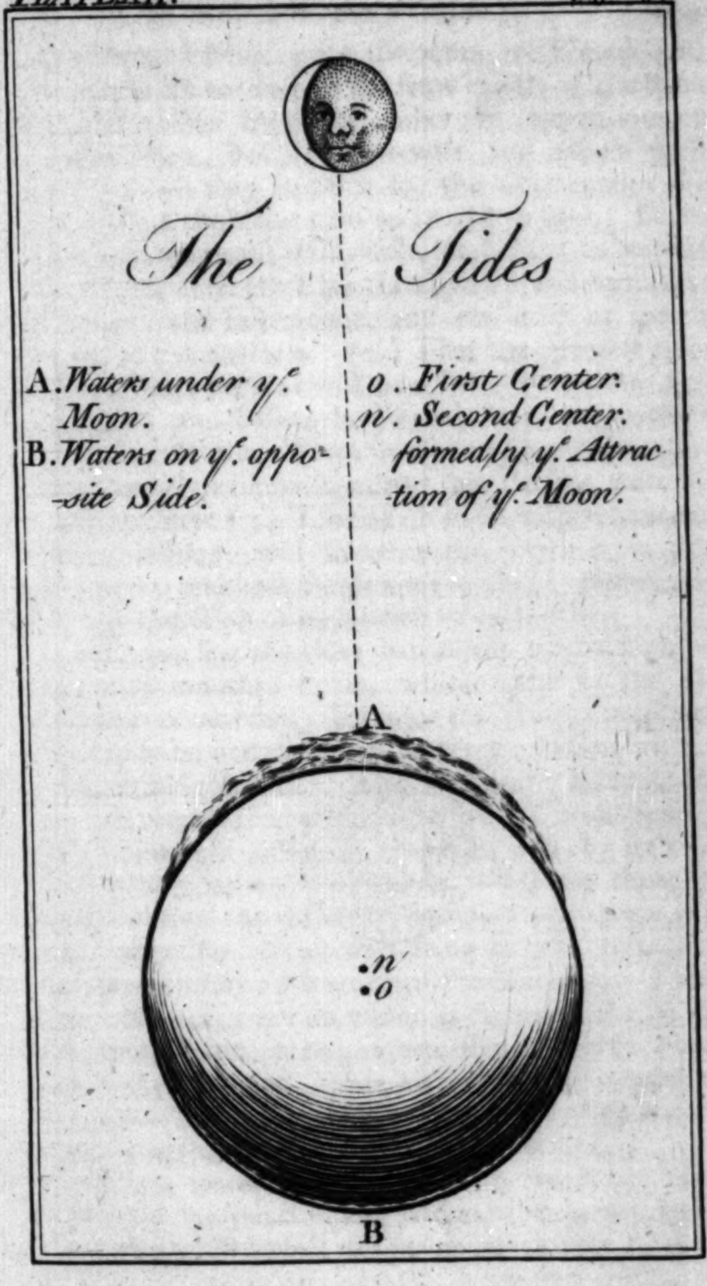
It is now univerſally admitted that the tides are produced by the ocean's being attracted by the Sun and Moon, but chiefly by the latter.

To render this ſubject as plain as poſſible, we muſt obſerve that the power of gravity or attraction conſtantly diminiſhes as the ſquare of the diſtance increaſes. This being the caſe, it will follow that the waters in that part of the Earth which is neareſt to the Moon, at any given time, muſt be more powerfully attracted by her than the central part of the Earth, and that the waters on the oppoſite ſide, as being ſtill farther from the Moon, muſt be leſs forcibly attracted than the parts near the center. The plain conſequence of this will be, not only that the waters neareſt to and directly under the Moon muſt have their diſtance from the center of the Earth increaſed, and experience a temporary ſwell, but likewiſe that the center of the Earth will be attracted to a greater diſtance from the waters on the oppoſite ſide than it was before, ſo that thoſe waters alſo will ſeem to ſwell and recede from the Earth's center, though in reality it is the Earth's center which recedes from them. It may be farther conceived, that the waters which are ninety degrees diſtant from the ſwell on either ſide, inſtead of receding from the center, muſt be made to fall or approach ſomething nearer to it by the oblique attraction of the Moon, and the efforts of the force of gravity (or of the Earth's attraction) to fill up the void occaſioned by the ſwelling of the tides. As the Earth therefore turns round its axis from the Moon to the Moon again, in twenty four hours and 50 minutes, there will be two tides of flood, and two of ebb, in that time, as we find by daily experience.

As the Sun alſo has ſome influence in raiſing the tides, (though but a ſmall one in compariſon of the Moon, on account of his great diſtance) they will not always anſwer exactly to the time of the Moon's coming to the meridian. When ſhe is in her firſt and third quarters they will happen ſooner, and ſomething later when ſhe is in her ſecond and fourth quarters; becauſe, in the former caſe, the tide raiſed by the Sun alone will be earlier than the tide raiſed by the Moon, and in the latter caſe a little later.

We have already obſerved that the orbits of the Moon and other planets are elliptical, and that the central body is in one of the focuſes. The Moon, therefore, in every lunar month, as ſhe goes round the Earth, muſt come once to her *Perigee*, and once to her *Apogee*, and attract the ocean moſt powerfully at the former of thoſe times, and leaſt at the latter; which is likewiſe the caſe with reſpect to the Sun. It is likewiſe plain that, as the equatoreal parts have the greateſt centrifugal force, the tides which are raiſed either by the Sun or Moon, muſt always be proportionably higher when thoſe luminaries are in the Equator: we may add, in the laſt place, that as the attractive forces of the

PLATE XII. page 234.


The Tides
A. Waters under yͤ Moon.
B. Waters on yͤ opposite Side.
o. First Center.
n. Second Center. formed by yͤ Attraction of yͤ Moon.
A
n
o
B

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the Sun and Moon upon the ocean are ſo conjoined as mutually to produce the ſame effects at the ſame places, when they are either in oppoſition or conjunction, but act croſs-wiſe and oppoſe each other when they are not ſo, the tides cannot riſe ſo high in the latter caſe as in the former. From theſe principles it will reſult, (1.) That in general the *ſpring-tides* (that is, the higheſt) will happen at the new and full moons, and the *neap* or loweſt tides at the quarters. (2.) That the greateſt tides throughout the year will be a little after the Autumnal, and before the Vernal Equinox; becauſe the Sun at thoſe times is not only very near the Equator, but likewiſe nearer his *Perigee* than his *Apogee*. And (3.) That the higheſt tides which can ever happen, will be when the Moon is in her *Perigee*, and both luminaries in the Equator, and in conjunction or oppoſition to each other.

In open ſeas the tides can never riſe ſo high as in wide-mouthed rivers, which open in the direction of the flux; becauſe the water muſt neceſſarily be accumulated by the oppoſition of the contracting banks. The tides are likewiſe ſo much retarded in their paſſage over different ſhoals, and through different channels, and by ſtriking againſt capes and head-lands, that the times of their arrival at different harbours and rivers will be very far from anſwering to the reſpective diſtances of the Moon from the Meridian. Thus, for inſtance, the tide which is raiſed by the Moon in the German ocean, when ſhe is three hours paſt the Meridian, takes twelve hours to come to *London Bridge*, by which time another tide will be raiſed in the ocean to ſucceed the former.

If the waters round the Earth were not thus affected by the Sun and Moon, the ocean being equally preſſed towards the center by the force of gravity, would continue in a perfect ſtagnation; and render the Earth uninhabitable.

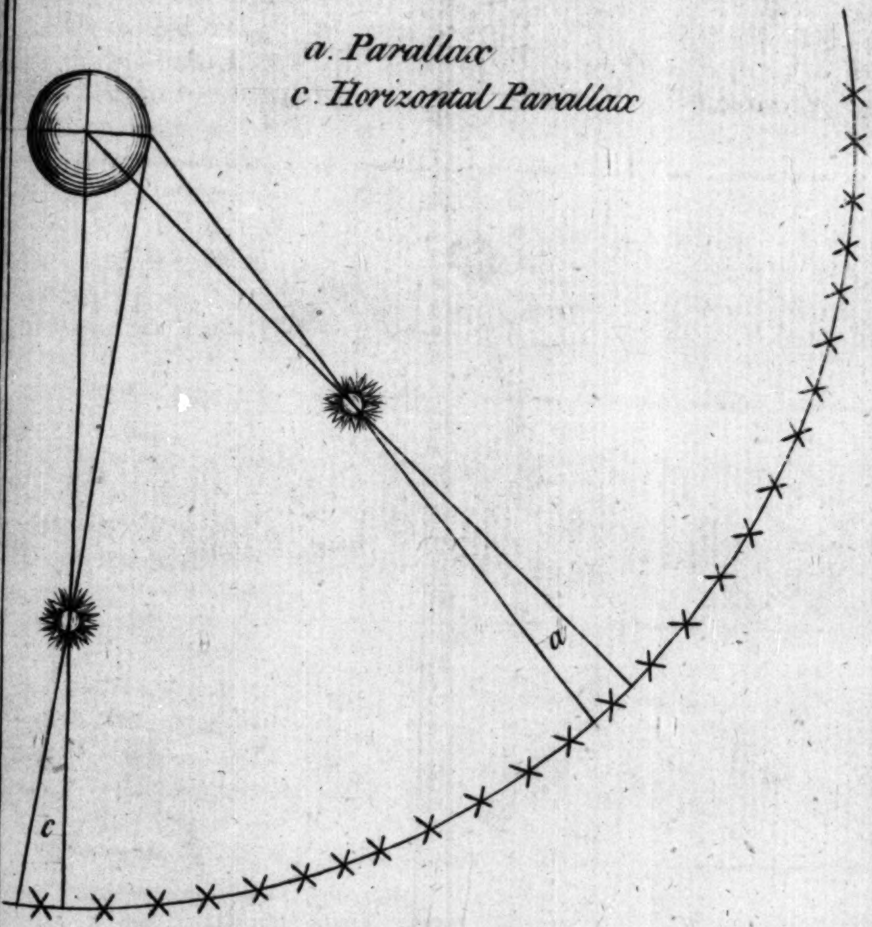
As to *lakes*, they being generally ſo ſmall that when the Moon is vertical ſhe attracts every part of them alike, and raiſes their whole ſurface to an equal height, they cannot have any tides; and the *Mediterranean* and *Baltic* ſeas experience very ſmall elevations, becauſe the inlets by which they communicate with the main ocean are remarkably narrow.

The air being much lighter than the water, and the ſurface of the atmoſphere nearer to the Moon than that of the ſea is, the Moon muſt raiſe much higher tides in the air than in the ocean, and contribute not a little to the variation of the wind.

§. XI. *Of the Parallaxes.*

A *Parallax* in Aſtronomy (from παραλλαττω to vary or change) is the change of the apparent place of the Sun or planets in the ſtarry heavens, when they are ſeen at the ſame given inſtant from different parts of the Earth. To explain the term more fully, it is eaſy to conceive, that if two ſtraight lines are drawn from two different points in the Earth's ſurface to the center of the Sun or any one of the planets, thoſe two lines will there meet and form an angle; and if they are produced ſtill farther till they reach the celeſtial ſphere or ſtarry heavens, they will croſs each other in the center of the Sun or planet, ſo as to form a ſecond angle oppoſite and equal to the firſt. The diſtance between the two points where thoſe lines will terminate in the ſtarry heavens, or the angle made by them, is called the *Parallax*, which is ſaid to be *ſenſible* when it is great enough to be diſtinguiſhed and meaſured by an inſtrument, and *inſenſible* when it is too ſmall to be ſo determined.

The


a. Parallax
c. Horizontal Parallax
a
c

The *diurnal* parallax of the Sun or planets, (which is the parallax that is generally meant when not diſtinguiſhed by any epithet) is an arch in the ſtarry heavens, or celeſtial ſphere, included between the apparent place of the heavenly object, as ſeen from any part of the Earth's ſurface, and its true place as ſeen from the center of the Earth.

A luminary which continues at the ſame diſtance from the center of the Earth at different altitudes, will have the greater parallax the farther it appears from the zenith of the obſerver; ſo that the parallax will always be greateſt when the luminary is in the Horizon, and deſtroyed when it is in the Zenith. From hence it follows that parallax always diminiſhes the altitude of any phænomenon, or makes it appear lower than it would if ſeen from the Earth's center.

One uſe of the parallaxes is to find the true place of a luminary; for, by adding the depreſſion occaſioned by the parallax to the apparent altitude of a phænomenon, we ſhall diſcover its real altitude.

Another uſe of the parallaxes is to find the diſtances of the heavenly bodies: for when, the parallax, and eſpecially the horizontal parallax, of any of them is given, their diſtance from the Earth may be computed by trigonometry, becauſe the Earth's ſemidiameter is well known.

The Moon being nearer to the Earth than any other planet, her parallax is greateſt, and therefore moſt eaſily determined. Her horizontal parallax is about one degree.

The *annual* parallax of a phænomenon is its apparent change of place in the heavens, as it is viewed from the Earth in different parts of her orbit;—but that of the ſtars muſt be inſenſible on account of their great diſtance.

CHRONOLOGY.

CHRONOLOGY is the ſcience of time, and explains the various methods of reckoning or computing it, ſo as to adjuſt it to different events and tranſactions. The name is derived from χρονος time, and λογος a diſcourſe.

The idea we have of time ariſes entirely from our conſidering ſome events as paſt, others as preſent, and ſome as future or yet to come: ſo that properly ſpeaking time is a continued ſucceſſion of events either natural or mechanical. By a *natural* event, I mean the relative poſition of any of the heavenly bodies; and by *mechanical* events, the ſucceſſive and regular motions of any part or parts of an artificial automaton.

The ordinary parts of time are, *years*, *months*, *weeks*, *days*, *hours*, *minutes*, and *ſeconds*.

The integral ſtandard, or original meaſure of time is a *year*; which is meaſured by the revolution of ſome celeſtial body in it's orbit; viz. the Sun or Moon, whoſe motions are moſt conſpicuous, and more eaſily determined by common obſervation than thoſe of any other celeſtial bodies. This is called the *natural* year, and is either *ſolar* or *lunar*.

The ſolar year, which is determined by the apparent revolution of the Sun round the Earth, is either *tropical* or *ſydereal*. The *tropical* year is the time which is meaſured by the revolution of the Sun from any one of the equinoctial or ſolſtitial points to the ſame point again, and contains 365 days, five hours, 48 minutes, and 57 ſeconds. The *ſydereal* year is the time which is meaſured by the Sun's revolution from any fixed ſtar to the ſame ſtars again, and contains 365 days, ſix hours, nine minutes, and 14½ ſeconds. The former of theſe is the true *ſolar* year; and the difference between them (as we have already obſerved) is owing to the *preceſſion* of the equinoxes.

The time which is meaſured by 12 lunations or revolutions of the Moon from the Sun to the Sun again, is called the *lunar* year, and contains 354 days, eight hours, 48 minutes, and 36 ſeconds.

This integral meaſure of time, as it has been variouſly adjuſted to the purpoſes of common life, and which is therefore called the *civil year*, is either *civil ſolar*, or *civil lunar*; the former is borrowed from the true *ſolar*, and the latter from the *lunar* year.

The *civil ſolar* year contains 365 days for three ſucceſſive years, which are therefore called *common* years; and 366 in the fourth, which is called the *Biſſextile* or *Leap-year*. This is likewiſe called the *Julian* year from *Julius Cæſar*, who appointed the intercalary or additional day to adjuſt the civil year to the ſolar. As the intercalary day was added to the 24th of February, which in the *Roman* way of reckoning was called *ſextus Kalendas Martii*, or the ſixth before the Kalends of March; and as the intercalation was made by ordering the *ſextus Kalendas*, &c. to be *bis* or twice repeated every fourth year, from hence obtained the name of *Annus biſſextilis*, or the *Biſſextile*-year. But this intercalary day is now added to the end of February.

The *civil lunar* year, which has been adopted by ſeveral nations, contains only 354 days: but this falling 11 days ſhort of the ſolar year, by which the ſeaſons are regularly determined, they were obliged to make every third year an *intercalary* or *embolimic* year, to which they uſually added a month to adjuſt the difference. The Jews, who followed this method of computation, made every third year an *embolimic* year, to which they added a month of 30 days; ſo that every three years they fell nearly four days ſhort of the *ſolar* year.

The *Julian* or *civil ſolar* year is made uſe of in *Europe*, and commences on the firſt of January. But as this is 11 minutes longer than the true ſolar year, which, though a trifling error in itſelf, amounts to a whole day in 130 years, and in a longer time becomes more conſiderable; Pope *Gregory* the *Thirteenth* obſerved in the year 1582, that the equinoxes and ſolſtices were 10 entire days backwarder than at the council of *Nice*, which was held in the year 325. As this neceſſarily occaſioned a great confuſion, by unfixing the times of the celebration of Eaſter and other moveable feaſts, he ordered ten days to be ſuppreſſed, by calling the 11th of March the 21ſt:—and to prevent the like variation for the future, he inſtituted a new form of years, from him called the *Gregorian*, by which a day is taken out of the calendar every 133d year. To effect this with as little confuſion as poſſible, he contrived it in the following manner:—from the 1600th year of the Chriſtian Æra, every 100th year, which, according to the *Julian* form, is always a *Biſſextile* or *Leap-year*, was to become *common* for three ſucceſſive centuries; but every 400th year was to remain a *biſſextile*, as in the *Julian* account. The *Julian* or *old-ſtyle*, as it is called; was uſed in England till September 1752, and produced a difference of 11 days between the foreign computations and our's: but at that time the eleven days were ſuppreſſed, and the *Gregorian* account or *new-ſtyle* adopted here, as it is in moſt other parts of Chriſtendom. This account is ſo nearly adjuſted to the true ſolar time, as to leave no room for any after-improvements; for it will be attended with an error of only a ſingle day too much in 5760 years.

We might here enumerate the different conſtitutions of the civil year which have prevailed in different countries: but as theſe enquiries are more curious than uſeful, they are foreign to our preſent deſign. It will not, however, be amiſs to obſerve that, on account of their feſtivals, the Greeks adopted the *civil lunar* year, which conſiſted of 12 months of 29 and 30 days alternately, to adjuſt them to the Moon's ſynodical period. The Romans likewiſe meaſured their year by *lunar* months, and among both people rules of intercalation were appointed to bring the lunar and ſolar years to as near an agreement as they were able. The care of theſe intercalations among the Romans was intruſted to the *pontifex maximus*, who neglected it ſo much that at the time of *Julius Cæſar* the winter months were fallen back to autumn. The ancient Egyptians divided their year into 12 months, each conſiſting of 30 days, to which were added five *epagomenæ* or intercalary days; accordingly Moſes, who was educated in the Egyptian court, aſſigns 150 days to five months, in his account of the deluge.

The moſt general diviſion of the year, in the computation of time, is into twelve *months*;—a diviſion at firſt ſuggeſted by the ſynodical periods of the Moon, of which ſhe performs twelve in ſomething leſs than a year. A month is either *aſtronomical*, or *civil*. The aſtronomical or lunar month is again ſubdivided, as has been already obſerved, into the *periodical* and *ſynodical* month. The *periodical* month is that ſpace of time in which the Moon makes one complete revolution from any given point of the Zodiac to the ſame point again; which is 27 days, ſeven hours, and 43 minutes. The *ſynodical* month, likewiſe called a *Lunation*, and from which the civil month was borrowed, is that ſpace of time in which the Moon after parting with the

Sun at a conjunction returns to him again: this contains 29 days, 12 hours, 44 minutes and ſix ſeconds. The *civil* month is that which was framed for the purpoſes of civil life, and conſiſts of a certain number of days, *fewer*, or *more*, according to the laws and cuſtoms of different nations. *Romulus* divided the year into 10 months. The *firſt* he dedicated to *Mars*, and from thence it was called *Martius*. The *next* was called *Aprilis*, from *aperio to open*, becauſe then the *buds* and *flowers* open, and diſcloſe themſelves to view. The *third* was named *Maius*, in honour of *Maia* the mother of Mercury. The *fourth* was named *Junius*, becauſe it was ſacred to *Juno*. To the ſubſequent months he gave names expreſſing their reſpective diſtances from *Martius*, or the *firſt* month. Thus, the *fifth* month was called *Quintilis*, and afterwards *Julius*, in honour of *Julius Cæſar*;—the ſixth *Sextilis*, but afterwards *Auguſtus*, in honour of *Auguſtus* the Emperor;—the ſeventh *Septembris*;—the eighth *Octobris*;—the ninth *Novembris*;—and the tenth *Decembris*. Of the above months *Martius*, *Maius*, *Quintilis*, and *Octob.* conſiſted of thirty-one days; and *Apr. Jun. Sext. Sept. Nov.* and *Dec.* of thirty each, making up in all 304 days. But *Numa*, Romulus's ſucceſſor, who was acquainted with *Pythagoras*, and better underſtood the celeſtial motions, found a neceſſity of adding two months more; one of theſe was dedicated to *Janus*, and therefore called *Januarius*; and the other was named *Februarius*, from *februo* to purify, bebecauſe the Roman feaſts of purification were celebrated at that time. For each of thoſe new months he took 25 new days (that is 50 for the two) to anſwer the courſe of the Moon; and then borrowed ſix days more from the ſix months, which conſiſted of 30 days. He likewiſe added one day out of mere ſuperſtition, amounting in all to 355. In this imperfect form the Roman year continued till the time of *Julius Cæſar*, who found it neceſſary, in order to reſtore the ſeaſons to their proper months, to appoint the year in which he began his reformation of the Calendar to conſiſt of 445 days; after which the *Julian account* commenced as above deſcribed. The Roman names of the months are ſtill uſed in Chriſtendom, and the number of days in each is ſpecified in the following memorial lines.

Junius, Aprilis, Septemque Novemque *tricenos*;
Unum addas reliquis; *viginti* Februus *Octo*.

Or.

Thirty days hath *September*,
April, *June*, and *November*;
February hath twenty-eight alone;
All the *reſt* have thirty-one.

Jewiſh Months.

			Days.
1.	Tiſri	Aug. Sept.	30.
2.	Marcheſvan	Sept. Oct.	29.
3.	Caſleu	Oct. Nov.	30.
4.	Tebeth	Nov. Dec.	29.
5.	Shebat	Dec. Jan.	30.
6.	Adar	Jan. Feb.	29.
7.	Niſan or Abib	Feb. March	30.
8.	Jiar	March, April	29.
9.	Sivan	April, May	30.
10.	Tamuz	May, June	29.
11.	Ab	June, July	30.
12.	Elul	July, Aug.	29.
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In their Embolimic or Leap-year, after *Adar* they added a month of 30 days called *Ve-Adar*.

Grecian Months.

			Days.
1.	Hecatombæon	June, July	30.
2.	Metagitnion	July, Aug.	29.
3.	Boedromion	Aug. Sept.	30.
4.	Pyanepſion	Sept. Oct.	29.
5.	Maimacterion	Oct. Nov.	30.
6.	Poſideon	Nov. Dec.	29.
7.	Gamelion	Dec. Jan.	30.
8.	Antheſterion	Jan. Feb.	29.
9.	Elaphebolion	Feb. March	30.
10.	Munichion	March, April	29.
11.	Thargelion	April, May	30.
12.	Schirrophorion	May, June	29.
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A month is divided into four parts called *weeks*. A week is a ſyſtem of ſeven days, inſtituted to perpetuate the memory of the creation; which being finiſhed in ſix days, the ſeventh was appointed to be a ſabbath or day of reſt. There are therefore, in a *Julian* year, 13 months compoſed of four weeks each, amounting in all to 52 weeks, and one day over. With us the ſeven days of the week are diſtinguiſhed by the names of as many gods, which our *Saxon* anceſtors worſhipped on thoſe days. Thus, *Sunday* was the day ſacred to the *Sun*; *Monday* to the *Moon*; *Tueſday* to the god *Tuiſco*; *Wedneſday* to the god *Woden*; *Thurſday* to *Thor*, the god of thunder; *Friday* to the goddeſs *Friga*; and *Saturday* to the god *Satur*. Among the Romans they were diſtinguiſhed by the names of the ſeveral planets, which, according to the ancient aſtrology, had the government of the firſt hour of their reſpective days; thus, *Sunday* was called *Dies Solis*; Monday, *Dies Lunæ*; Tueſday, *Dies Martis*; Wedneſday, *Dies Mercurii*; Thurſday, *Dies Jovis*; Friday, *Dies Veneris*; and Saturday, *Dies Saturni*.

A *day*, which is the ſeventh part of a week, is either *natural*, or *artificial*. An *artificial* day is the time from ſun-riſing to ſun-ſetting, and muſt therefore be of different lengths at different times of the year, except in thoſe places which lie under the Equator. A *natural* day is that ſpace of time which elapſes while the Earth turns once round it's axis, or while the Sun apparently revolves from any given meridian to the ſame meridian again. All nations do not begin their natural day alike. The ancient *Babylonians*, *Perſians*, *Syrians*, and moſt other eaſtern nations, and the modern *Greeks* and inhabitants of the *Balearic* Iſlands begin their day from *ſun-riſing*:—the ancient *Athenians*, and the *Jews*, and modern *Italians*, *Auſtrians*, *Bohemians*, *Sileſians*, and *Chineſe*, from *ſun-ſetting*:—the ancient *Egyptians* and *Romans*, and the modern *Engliſh*, *French*, *Dutch*, *Germans*, *Spaniards*, and *Portugueſe* from midnight:—and the ancient *Umbri*, and *Arabians*, and modern Aſtronomers from *noon*. It will not be amiſs to add, for the benefit of my claſſical readers, that *Numa diſtinguiſhed* the days of the year into

(1.) The *Dies Feſti*, or days ſacred to the gods, for the celebration of their *Sacrificia*, *Epulæ*, *Ludi*, and *Feriæ*.

(2.) The *Dies Profeſti*, or days allotted to *civil* buſineſs. Theſe include the *Faſti*, which were the ſame as our *court-days*;—the *comitiales*, when the public aſſemblies of the people were held; the *comperendini*, or days of *adjournment*, when perſons might give bail;—the *ſtati*, or days for deciding cauſes between Romans and foreigners;—and the *prœliares*, or days when it was lawful to engage an enemy.

(3.) The *dies intercisi*, including a part of both the former, in *ſome hours* of which it was lawful to ſit in judgment, and in *ſome not*.

And (4.) The *dies atri* or *nefaſti*, which were reckoned unfortunate days; ſuch as the *dies poſtriduani*, the next day after the *Kalends*, *Nones*, or *Ides*, and the day before the fourth of each.

A day is divided into *hours*, of which there are two ſorts, viz. the equal and unequal. The *equal* hour is the 24th part of a *natural* day, as meaſured by a well-regulated clock: but theſe hours, as meaſured by the ſucceſſive returns of the Sun to the Meridian, are not exactly equal, on account of the obliquity of the Ecliptic, and the Sun's unequal motion in it. The *unequal* hour is the 12th part of the *artificial* day or night, and muſt therefore be of different lengths at different ſeaſons, except in the equatoreal parts of the Earth. The *unequal* hours were formerly uſed by the Jews and Romans, as they are at this day by the Turks; ſo that the *ſixth* hour of the day was their noon, and the *ninth* hour mentioned in the account of the crucifixion of our Saviour was our three o'clock in the afternoon. The Romans diſtinguiſhed the night into four *watches* or *vigiliæ*, each conſiſting of three nocturnal hours, which were of different lengths at different ſeaſons of the year. The *excubiæ* were different from the *vigiliæ*, being the ordinary *watches* kept in their camps by day.

An *equal* hour is divided into ſixty equal parts called *minutes*; a minute into ſixty *ſeconds*; and a ſecond into ſixty *thirds*. But the *Jews*, *Chaldeans*,

Chaldeans, and *Arabians* divide an hour into 1083 equal parts called *ſcruples*, 18 of which are equal to a minute.

In the computation of very large intervals or ſpaces of time, it was found convenient to proceed by combinations or claſſes of years; which have been different among different nations. The moſt remarkable are,

(1.) The *ſabbatical* year, or *week* of years, among the Jews: for as among them every ſeventh day was holy, and a day of reſt, ſo every ſeventh year was a year of reſt to the ground, during which they were neither to ſow nor reap.

(2.) The *Jubilee*, another period in uſe among the Jews, and conſiſting of 49, or as ſome will have it 50 years. At the expiration of this period, the laſt year of which was obſerved with great ſolemnity, all their ſlaves were made free, and all lands which had been ſold or mortgaged reverted to their ancient owners. A very benevolent inſtitution, and worthy of their divine legiſlator!

(3.) The Grecian *Olympiad*, conſiſting of four years, at the expiration of which the *Olympic* games were celebrated with extraordinary pomp near the city *Olympia* in *Peloponneſus*. They were orginally inſtituted by *Hercules* in honour of *Jupiter*: but being afterwards diſcontinued, were revived by *Iphitus* in the 776th year before Chriſt.

(4.) The Roman *Luſtrum*, a period of five years, and ſo called from *luo* to *expiate*, or *cleanſe*; becauſe once in about that time the *Cenſus*, or general muſter of the Roman people, firſt inſtituted by *Servius Tullius*, was held in the *Campus Martius*, (a large plain without the city near the banks of the river Tiber) and a ſolemn

Luſtrum, or expiatory ſacrifice, there made in the name of the whole nation.

(5.) The *ſeculum*, or *age*, conſiſting of 100 years, and anſwering to the modern *century*.

The above claſſes or combinations of years might have been properly called *cycles:* for a *cycle* (from κυκλος, a *circle*, or *round*) is a perpetual round or circulation of the ſame parts of time, whatever be their length or denomination. But the *cycles*, commonly ſo called, are the *cycle of the ſun*, the *cycle of the moon*, and the *cycle of indiction*. The *lunar cycle* is the moſt ancient of the three, and was firſt introduced among the Greeks: for as this people made it a point of religion to confine their feſtivals to the ſame ſeaſons of the year as nearly as poſſible, and as they meaſured their months by the *ſynodical* revolutions of the Moon, they found themſelves obliged to contrive rules of *intercalation* to adjuſt the lunar year to the ſolar: ſeveral methods were tried for this purpoſe, but they were all found to be defective, till at laſt the *Metonic* cycle of 19 years was introduced, ſo called from *Meto* an *Athenian*, the firſt inventor of it. This great aſtronomer obſerved, that if the Sun and Moon were to ſet out together from the ſame point of the Zodiac, they would meet there again after 19 ſolar years or revolutions, and begin a new period agreeing with the former. He likewiſe found that in the 19 ſolar revolutions there were 235 lunations, which made 19 lunar years, and ſeven lunar months. He therefore compoſed his cycle of 12 lunar years, conſiſting of 12 lunations each, and ſeven intercalary years each containing 13 lunations: ſo that in every ſucceeding cycle, the new and full Moons (which were to regulate the feſtivals) returned not only on the ſame days on each correſponding year of the cycle, but nearly on the ſame hours of the day. Upon the ceaſing of the Grecian feſtivals, the uſe of this cycle ceaſed with them during ſeveral centuries: but as the council of *Nice* abovementioned fixed *Eaſter-day* to the firſt *Sunday* after the firſt full Moon which happened after the vernal equinox, the *Metonic* or lunar cycle was again brought into uſe among the *Chriſtians*, as being the beſt that could be found to adjuſt the phaſes of the Moon to the courſe of the Sun. We may eaſily conceive from hence, not only the reaſon why *Eaſter* and it's dependent feaſts are moveable, (viz. becauſe *Eaſter* is determined by the time of the full Moon juſt mentioned, which muſt happen ſooner or later in different years;)--but likewiſe that if a table is conſtructed, in which the times of the firſt full Moons after the vernal equinox are determined for every year of one lunar cycle, they muſt happen on the ſame days, and conſequently, by referring to the table, may be immediately found for any correſponding year of every ſucceeding cycle; ſo that the *Eaſter-Sunday*, as being conſtantly determined by thoſe full Moons, may by this means be very eaſily known. As this cycle was ſo remarkably uſeful in eccleſiaſtical computations, it was highly eſteemed among the Chriſtian clergy, and the number that year of it which correſponded with any then preſent year of the Chriſtian æra was written in the Calendar oppoſite the day of the full Moon in letters of gold: for this reaſon, in our preſent almanacks, that number or year of the cycle which accords with any given year of our Lord is called the *golden number*. The firſt year of Chriſt, according to the vulgar æra, nearly coincided with the ſecond of the lunar cycle; if therefore we add one to any given year of our Lord, and divide the ſum by 19, the quotient ſhews the number of revolutions of the cycle from the commence-

ment

ment of that æra, and the remainder is the *golden number* for the given year. If there is no remainder, the golden number is 19, being the laſt year of the cycle.

As the true *lunar* cycle is one hour 16 minutes and 30 ſeconds ſhorter than 19 Julian years, the difference muſt in time become conſiderable; ſo that after the 76 revolutions of this cycle, which have happened between the time of the Nicene Council and the preſent year, the real new and full Moon in the heavens would have anticipated, or preceeded thoſe in the Calendar of the Common-prayer-book, for the *old ſtyle* or *Julian* account, more than four days, and been ſix days too late for the *new ſtyle*, if the Calendar had not been rectified as already mentioned.

In the *Gregorian* or Popiſh Calendar the *golden-number* is thrown out, and what is called the *epact* introduced in it's ſtead. An *Epact* is the exceſs of the common or civil ſolar year above the lunar, which latter conſiſts (as we have already obſerved) of 12 lunations. This exceſs amounts in round numbers to 11 days. If therefore the Sun and Moon are in conjunction on the laſt day of any given civil ſolar year, they will at the end of the next year be 11 days paſt their conjunction: at the end of the ſecond year they will have paſſed the conjunction 22 days, and at the end of the third 33: which ſhews that the third lunar year, to bring it up to the ſolar one, muſt conſiſt of 13 lunations and three days over. At the end of the fourth civil ſolar year, if we ſtill continue to add 11 days as before, the epact (including the three ſupernumerary days) will be 14; at the end of the fifth it will be 25; and at the end of the ſixth it will be only ſix, becauſe an intercalary lunation of 30 days muſt be ſubſtracted from the exceſs, which amounts to 36 days. At the end of the ſeventh year the epact will be 17; and ſo on, adding 11 days continually, and ſubſtracting 30 when the exceſs amounts to more, till we have proceeded through 19 civil years; after which the epacts and lunar aſpects will be the ſame for every year of the ſucceeding cycle as in the correſponding years of the preceeding one.

From hence it is evident that if we multiply the golden number for any given year of the Chriſtian æra by 11, and divide the product by 30, the quotient will ſhew how many intercalary months or lunations there have been from the commencement of the then preſent lunar cycle, and the remainder will be the Julian epact, or number of days paſt the conjunction, for the given year. Thus for example if it be required to find the *epact* for the year 1751, the operation will be as follows.

```
    1751
       1
   ------
19)1752(92 Number of lunar cycles elapſed
   171     ſince the birth of Chriſt.
   ------
     42
     38
   ------
      4 golden number for 1751.
     11
   ------
  30)44(1 intercalary lunar month.
     30
   ------
     14 Epact for 1751 Julian account.
```

But as we have already obſerved that the Julian account differs at preſent 11 days from the

Gregorian, or true account, which is now uſed in England; we muſt ſubſtract 11 from the Julian epact, to find the Gregorian or modern epact, firſt adding 30 to the former if it is leſs than 11. Thus to find the Gregorian epact (which is the only one now uſed) for the year 1772, the work will ſtand thus;

1772	6
1	11
19)1773(93	30)66(2
171	60
63	6 Julian epact
57	30
6 Golden number for the given year.	36
	11
	25 Greg. epact required.

To illuſtrate the uſe of the golden numbers and epacts in finding the time of the firſt full moon after the vernal equinox, (which is the uſe for which they were intended) let us ſuppoſe that the times of ſuch full moons have been obſerved for every ſucceſſive year of one entire lunar cycle, and that either the golden number or epact of each of thoſe years is placed (as it always is) oppoſite to that month and day of the month, in the Calendar of a Common-prayer-book, on which the ſaid paſchal, or Eaſter full moon, for each year has been found to happen:—then, as we have already obſerved that the abovementioned full moons (as well as all others) muſt conſtantly return on the ſame months and days for all the correſponding years of every ſucceeding cycle, for nearly 300 years to come; it is evident that by finding the golden number or epact of any given year, within that term, you may likewiſe by only inſpecting the Calendar diſcover the day of the paſchal full moon. Thus, the golden number for the year 1771 is found to be five, by the rule above given: if, therefore, you look for five in the left-hand column of the Calendar belonging to March and April, you will find it oppoſite to March the 30th, which was the day of the paſchal full moon for the given year. As the length of a lunation or ſynodical month is only 29½ days, the earlieſt paſchal full moon cannot happen before the 21ſt of March (which is the vernal equinox) nor the lateſt after the 18th of April: this is the reaſon that in the Calendar the 19 golden numbers are placed oppoſite only to thoſe two days, and 17 of the 27 intermediate days.

The next cycle is the *ſolar* one, or *cycle of the ſun*, which conſiſts of 28 civil years. It is ſo called becauſe it determines the *Dominical letter*, or character of *Sunday*: for in the Calendar the ſeven days of the week are diſtinguiſhed by the ſeven letters A B C D E F G. If the year conſiſted exactly of 52 weeks, it is evident that the ſame days would conſtantly be diſtinguiſhed by the ſame letters: but as it conſiſts of 52 weeks and one day over, it is equally plain that the year muſt begin and end on the ſame day of the week, and that the next year muſt begin on the following day. Hence, if any year begins on *Sunday*, as the firſt day of every year is diſtinguiſhed by the letter A, that letter will then be the Dominical letter, and continue to be ſo till the year is expired: but as the next year will begin on Monday, and with the letter A as uſual, the Sunday will then fall on the ſeventh day of the year, and be repreſented by the letter G, which conſequently will be the Dominical letter for that year. As the third year will begin on *Tueſday*, the firſt Sunday will then be the ſixth day of the year, and have the letter F for it's character; and in the ſame manner it will be ſucceſſively diſtinguiſhed by E, D, C, and B every following year, till the expiration of the ſeven years, if they were all common ones; after which the eighth year, in the ſame manner as the firſt, would begin on *Sunday*, which would again be diſtinguiſhed by the letter A. But every fourth year is a leap-year, conſiſting of 52 weeks, and two days over; and therefore if it begins on *Sunday*, it will end on *Monday*; ſo that the next year beginning on *Tueſday*, the *Sunday* will not fall on the 7th of January as before, but on the ſixth, and be repreſented by the letter F, inſtead of G. By this means, the leap-year returning every fourth year interrupts the order of the Dominical letters; ſo that the ſeries cannot return to its firſt ſtate till four times ſeven, *i. e.* 28 years are expired, after which the ſame days of the month will again fall upon the ſame days of the week as in the preceeding cycle. To find the year of the ſolar cycle, add nine to the given year of the Chriſtian æra, and divide the ſum by 28; the quotient will then be the number of cycles which have elapſed ſince the birth of Chriſt, and the remainder the year of the preſent cycle, or (as it is uſually called) the cycle of the given year: if there is no remainder, the cycle is 28.——To find the Dominical or Sunday letter, till the year 1799 incluſive, add to the year of our Lord its fourth part, omitting fractions: then addingunity (or one) to the ſum, divide it by ſeven; and the remainder, by re-

referring it to the annexed table*, will ſhew the letter required. But in all biſſextile years the letter thus found does not take place till after the intercalary days: for the 23d and 24th of February are then both diſtinguiſhed by the ſame letter. To find the Dominical letter for the next century, only its fourth part is to be added to the current year, and the ſum divided as before.

To find Eaſter by the Calendar, look for the golden number for the current year, and oppoſite to it you will find the day of the paſchal full moon. Then the Sunday letter for that year which next follows the day of the ſaid full moon in the Calendar, will ſhew the day of the month on which Eaſter Sunday falls.

The laſt cycle to be noticed is the *cycle of indiction*, a period of 15 years, which has no connection with the celeſtial motions, but was inſtituted by Conſtantine for the payment of certain taxes. He reduced the time the Romans were obliged to ſerve to 15 years, and conſequently every 15 years he was obliged *indicere*, or to impoſe an extraordinary tax for the payment of thoſe who were diſcharged. The Roman or Papal indiction begins on the firſt of January. The Popes before they were made ſovereigns by *Charlemaigne*, uſed to date their bulls

*TABLE.

0	A
1	G
2	F
3	E
4	D
5	C
6	B

bulls or acts by the years of the Emperors, but they have ſince dated them by the year of the indiction.

To find the *year of the indiction* add three to the preſent year, and divide the ſum by 15: the quotient will be the number of theſe cycles which have revolved ſince the commencement of the Chriſtian æra, and the remainder the year of the preſent cycle. If nothing remains, the *indiction* is 15.

From the multiplication of the *ſolar* and *lunar* cycles, and that of the *indiction*, into each other, ariſes the *Julian period*, ſo called becauſe the years of it are adapted to the *Julian* form. It conſiſts of 7980 years, and had its beginning 764 years before the creation of the world, according to *Strauchius*, *Scaliger*, and moſt others; but only 710 years according to Archbiſhop *Uſher*: The three cycles all began when this grand period commenced; and there are no two years throughout the whole extent of it which have the ſame numbers for each of the three cycles. For this reaſon, if hiſtorians and chronologers had always diſtinguiſhed the time of every event by the cycles for the year when it happened; there would no room have been left to diſpute their meaning.

The *vulgar* or *Dionyſian* æra of Chriſt's birth (ſo called becauſe it was firſt ſettled in the year 527 by *Dionyſius Exiguus*, a Roman abbot) commenced about the end of the 4713th year of the Julian period; ſo that the firſt year of his age was the 4714th of that period. Conſequently, to find what year of the Julian period anſwers to any given year ſince Chriſt, add the current year to 4713; but if a given year bears date before Chriſt, ſubſtract its number from 4714. If the numbers of the three cycles are given to find the year of the Julian period, multiply the golden number into 4200, the year of the ſolar cycle into 4845, and that of the indiction into 6916; then adding the products together, and dividing the ſum by 7980, the remainder will be the year of the Julian period required.—On the other hand, to find the cycles for any given year of this period, divide the given year by 28, 19, and 15 reſpectively as above; and the three remainders will be the three cycles required.

Beſides the above cycles or periods there are likewiſe different *dates*, or points of time, from whence hiſtorians begin their computations, as aſtronomers do theirs from certain fixed points in the Heavens. Theſe are called *Æras* or *Epochas*. An *Æra* is ſo called, according to *Scaliger* from *æs, æris*, which he ſays was a word uſed among the ancient Romans for an article or *item* in an account; according to others it is derived from *æra*, darnel, a remarkable weed among wheat; and according to ſome from *æra*, a mark upon money to determine its value. An *Epocha* is derived from *εποχη*, *remora*, as being an occurrence which the mind *reſts* or *dwells* upon, and from which it begins a ſeries of years. The moſt remarkable are the following.

	Before Chriſt	Julian Period
Common Æra of the Creation	3950	765
Univerſal Deluge,	2351	2362
Deſtruction of Troy	1184	3529
Firſt Olympiad began	776	3938
Building of Rome	753	3961
Æra of Nabonaſſar	746	3967
Death of Alexander the Great	324	4390
Chriſtian Æra	Chriſt born	4714
Diocleſian Æra	284	4997
Hegeira of the Turks	622	5335
Jeſdegird of the Perſians	632	5345

There are other epochas of a more particular nature, and which are uſed only by particular nations. Thus in England we ſometimes reckon from the invaſion of the Romans under Julius Cæſar, 55 years before Chriſt;—ſometimes from the conqueſt by William I. A. D. 1066;—ſometimes from the revolution by the glorious William III. 1688*; and ſometimes from the acceſſion of a collateral branch of the royal family in George I. 1714.

The *Diocleſian* or vulgar æra of our Saviour's birth ſeems to begin about four years too late: for it is evident from the maſſacre of the young children recorded in Mat. 2d chap. that he muſt have been born before Herod's death; and we are told by *Joſephus* (Lib. XVII. chap. i.) that in *Herod's* laſt illneſs there was an eclipſe of the Moon. But this eclipſe appears from our aſtronomical tables to have been ſeen at Jeruſalem, on March the 13th at three in the morning, in the 4710th year of the Julian period: ſo that the lateſt time at which we can fix the birth of Chriſt muſt be at the latter end of the preceeding year.

It is likewiſe remarkable that in the 4th year of the 202d Olympiad, which anſwers to the 4746th of the Julian period, we are told by *Phlegon*, a heathen writer, that "there happened the moſt "extraordinary eclipſe of the Sun that ever was "ſeen." Since, therefore, there could be no total eclipſe of the Sun at Jeruſalem in that year, in a natural way, as appears by calculation, it is highly probable that it was the year of the crucifixion. This hypotheſis is ſtill farther ſupported by reflecting that our Lord was crucified on a *Friday*, and on the day of Paſſover, which *Joſephus* ſays was always kept on the 14th of *Niſan* (that is, on the full moon) when the Sun was in *Aries*; for the only paſchal full moon which happened on a

Friday within ſeveral years both before and after the diſputed year of the crucifixion, was that which happened on April the 3d in the 4746th year of the Julian period.

There is a remarkable coincidence between the crucifixion, as we have now ſtated it, and the prophecy of Daniel in the 24th, 25th, 26th, and 27th verſes of the chapter of the book which goes under his name. For it appears both from *Poltemy's* canon, and the famous æra of *Nabonaſſar*, that the ſeventh year of the reign of *Artaxerxes Longimanus* (called alſo *Ahaſuerus*) correſponded with the 4256th of the Julian period, at which time the king of Perſia gave his royal mandate to Ezra *to reſtore and build Jeruſalem* ; ſo that, if to 4256 we add the prophet's 70 weeks or 490 years (each day being reckoned a year) the crucifixion will be fixed, as before, to the 4746th year of the Julian period.

I have dwelt the longer on this particular, becauſe I thought it would not be diſagreeable to the moſt valuable part of mankind, I mean thoſe who have a juſt reverence for the beſt and the only true Religion in the world.

APPENDIX.

APPENDIX.

IT will not be amiſs, for the benefit of my claſſical readers, to cloſe this ſubject with ſome account of the Roman calendar and method of dating their time.

Of the Roman Calendar and Date.

The *Calendar* is a table in which all the days of the year are ſet down in their order according to their months, and diſtributed into weeks with a proper diſtinction of the *feaſts*, *law days*, &c. The Romans divided the days of each month into *calends*, *nones* and *ides*.

The *calends*, which fell upon the firſt day of every month, and were called the *calends* of that month, were ſo denominated from the old verb *calo* to call or ſummon; becauſe at the beginning of every month, the inferior prieſts aſſembled the people in the Capitol, and called over as many days as were between that and the following nones, whoſe number was variable.

The *nones* fell upon the *ſeventh* day of the month in *March*, *May*, *July*, and *October*; and upon the *fifth* in all other months. They were ſo called becauſe they were nine days from the ides, reckoning both incluſive. It is plain from hence, that when the *nones* fell on the *ſeventh* day of the month, as ſuppoſe of *March*, the ſecond day was VI. *non. Mart.* i. e. *ſextus nonas Martii*, or the *ſixth* day before the *nones of March*;—the third V. *non. Mart.*—the fourth IV. *non. Mart.*—the fifth III. *non. Mart.*—the ſixth *prid. non. Mart.* i. e. *pridie nonas Martii*, or the day before the nones of *March*; and the ſeventh *nonæ Mart.*

When

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When the nones fell on the *fifth* day of the month, as ſuppoſe of December, the ſecond was IV. *non. Dec.* and ſo on.

The *ides*, which were conſtantly *eight* in number, were ſo called from the obſolete verb *iduo*, to divide, becauſe they generally fell about the *middle of the month*. The day therefore immediately following the nones was called VIII. Id. or *octavus Idus*, the eighth day before the ides of its reſpective month, and ſo on till they came to *pridie Idus*, and the *Ides* themſelves, which always fell on the eighth day after the nones.

After the ides were over, the next following day was called XVI. XVII. XVIII. or XIX. calend. *i. e.* the ſixteenth, ſeventeenth, eighteenth, or nineteenth day before the calends of the following month, according to how many days intervened; ſo that the laſt day of every month was prid. calend. or the day before the calends of the next month. Every leap-year the 24th and 25th of February were both counted in the Calendar as one day, or, which is the ſame thing, the 24th was counted twice.

To facilitate the practice of the Roman method of dating, the following memorial lines may be of ſome ſervice.

March, *May*, *July*, *October*, do contain
Six nones; the reſt but *four*. Each month does claim
Eight ides; next after thoſe, the *calends* throng,
Which always to the following month belong.

EXAMPLES.

Calendis Januarii,	on the 1ſt of January.
Quarto nonas Auguſti,	on the 2d of Auguſt.
Idibus Julii,	on the 15th of July.
Septimo calendas Aprilis,	on the 26th of March.
Pridie calendas Junii,	on the 31ſt of May.
Sexto idus Martii,	on the 10th of March.

A TABLE of the Roman Calendar.

Days	Martius. Maius. Julius. October.	Januarius Auguſtus December	Aprilis Junius September Novemb.	Februarius	Leap Year
1	Kalendæ	Kalendæ	Kalendæ	Kalendæ	K.
2	VI	IV	IV	IV	IV
3	V	III	III	III	III
4	IV	Prid.Non.	Prid.Non.	Prid.Non.	P.N.
5	III	Nonæ	Nonæ	Nonæ	N
6	Pridie Nonas	VIII	VIII	VIII	VII
7	Nonæ	VII	VII	VII	VI
8	VIII	VI	VI	VI	VI
9	VII	V	V	V	V
10	VI	IV	IV	IV	IV
11	V	III	III	III	III
12	IV	PridieIdus	PridieIdus	Prid. Idus	P.I.
13	III	Idus	Idus	Idus	I
14	Pridie Idus	XIX	XVIII	XVI	XVI
15	Idus	XVIII	XVII	XV	XV
16	XVII	XVII	XVI	XIV	XIV
17	XVI	XVI	XV	XIII	XIII
18	XV	XV	XIV	XII	XII
19	XIV	XIV	XIII	XI	XI
20	XIII	XIII	XII	X	X
21	XII	XII	XI	IX	IX
22	XI	XI	X	VIII	VIII
23	X	X	IX	VII	VII
24	IX	IX	VIII	VI	VI
25	VIII	VIII	VII	V	V I
26	VII	VII	VI	IV	IV
27	VI	VI	V	III	IV
28	V	V	IV	Prid. Cal.	III
29	IV	IV	III		P.K.
30	III	III	Prid.Chal.		
31	Prid.Calend.	Prid. Cal.			

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